



# Empowering Women: E-Shakti's Impact on Self-Help Groups Digitization and Financial Inclusion in India

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## Authors' contributions

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## ABSTRACT

The study assesses the influence of the National Bank for Agricultural and Rural Development's (NABARD) Project E-Shakti on the digitization of Self-Help Groups (SHGs) and the economic position of women in India. The study evaluates the project's outcomes using data from NABARD's Status of Microfinance in India reports from 2007-08 to 2022-23. The number of SHGs credit linked, savings of SHGs, loans disbursed to them, loans outstanding against them, and non-performing assets (NPA) were the variables considered for the study. Trend analysis and correlation were applied to the available data. For the analysis of the data, the Python algorithm was used. The study's findings indicate that Project E-Shakti intensely boosted the number of districts served and SHGs linked to formal finance, reducing their dependency on informal sources. The project also resulted in a significant increase in loan disbursement to SHGs, indicating enhanced financial sustainability and accessibility. The digitization of SHGs improved women's economic conditions by allowing them to engage in income-generating activities. The programme helped to reduce non-

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performing assets, signifying its beneficial impact on the financial health of SHGs. Refinance to Non-Banking Financial Companies- Microfinance Institutions (NBFC-MFIs) showed a boost after E-Shakti but then a volatile pattern was observed in the subsequent years. Project E-Shakti was a success in terms of promoting digitization, increasing financial inclusion, and improving women's economic empowerment in SHGs. To maximize the long-term benefit of digitization programmes, the study proposes increasing their scope, investing in digital literacy training, and enhancing monitoring and evaluation procedures.

*Keywords: NABARD; Self-Help Groups (SHGs); e-shakti; digitization; financial inclusion; economic empowerment; microfinance; women.*

## 1. INTRODUCTION

National Bank for Agricultural and Rural Development's (NABARD) notable initiative is the Self-Help Group (SHG) movement, which specifically focuses on women who are economically disadvantaged and without assets or credit. NABARD, in partnership with the Reserve Bank of India (RBI), developed a supplementary loan distribution system via SHGs that utilizes the power of savings, peer influence, and community social guarantees to make SHGs attractive to banks. The Self-Help Group Bank Linkage Programme (SHG-BLP) is a unique microfinance initiative that originated locally [1]. The implementation of credit linkage for almost 4750 SHGs had a significant impact on the banking and financial industry, leading to the integration of the program into the banking sector in 1996. Although the plan had significant success in including rural communities that were previously excluded from the mainstream economy, it faced many significant difficulties and problems throughout its expansion and development. Traditional manual accounting does not meet the standards required by banks due to a lack of transparency inside groups. The absence of credit history for SHG members makes it difficult for banks to evaluate and oversee SHGs properly. Furthermore, the lack of consistent support and guidance from non-governmental organizations (NGOs) further hampers the situation. Due to the said concerns, several SHGs have experienced delays and inadequate or no credit. As a result, NABARD decided to digitize and regularly update the data and accounting of SHGs [2].

Bankers providing credit and credit plus services to organizations need reliable transactional SHG data. Technology may help the SHG-BLP, which uses manual accounting and bankers visiting SHGs for evaluation and monitoring. Digitizing SHGs was intended to solve some of the program's issues and increase bankers' SHG

involvement. Digitally empowered SHGs are predicted to greatly promote financial inclusion and social empowerment [3].

The Indian government has undertaken various efforts to digitize the nation and make government services accessible online in recent years. The JAM trinity, which includes Jan Dhan accounts, the Aadhaar ID system, and mobile technology, represents a considerable step towards digitalization. Another endeavor in this approach is the conversion of Kisan Credit Cards (KCCs) into Rupay ATM/Debit Kisan Credit Cards (RKCCs). In March 2015, NABARD, in keeping with the Hon'ble Prime Minister's vision of a Digital India and its line of thought on digitization, launched the "E-Shakti" pilot project for SHG digitization [4]. The word "Shakti" signifies "power." The main objective was to use technology to empower SHGs, to address the problem of bookkeeping by capturing the credit history of SHG members, generating SHG grading reports based on its financial and non-financial records, and making them available to all important stakeholders [5,6]. The stakeholders, notably lenders, may now make informed judgments for offering credit links based on reports provided using E-Shakti.

### 1.1 Project E-Shakti

In 2015, NABARD initiated the pilot project E-Shakti in two districts, i.e., Ramgarh (Jharkhand) and Dhule (Maharashtra), aimed at digitizing data of SHGs to improve business operations with them. The project was later extended to 100 districts across the country from 2016 to 2017, in alignment with the Government of India's "Digital India" initiative. The E-Shakti project, launched by NABARD, aims to provide easy access to the social and financial information of SHGs that maintain Saving Bank accounts with banks through its dedicated website and an Android-based mobile/tablet app. The project captures all types of financial transactions and non-financial operations, such as meetings and decisions at

the SHG level. It stores the information digitally on the E-Shakti portal. The authenticity and transparency of the data are maintained through sample audits, and members receive SMS alerts about their savings and loan outstanding. The project also generates Management Information System (MIS) reports and allows for real-time tracking of progress. By improving access to digital financial services, the programme aims to increase revenue and improve the livelihoods of SHGs members. NABARD is giving training on the usage of digital technologies such as mobile banking and point of sale (POS) equipment for transactions as part of the initiative. Improving access to digital financial services, the effort is expected to help SHGs increase their income and livelihood.

The NABARD E-Shakti initiative is an innovative strategy to expand the financial inclusion of SHGs through the digitization of their records and activities. The project captures essential information such as monthly meetings, financial transactions, loan outstanding, SHG grading, and balance sheet position, which banks can use to make credit decisions. This project has been recognized for its impact and innovation, winning the Association of Development Financing Institutions in Asia and the Pacific (ADFIAP) Outstanding Project Award in the Financial Inclusion category in 2019 and being mentioned in the BRICS Digital Financial Inclusion Report, India, 2021 as one of the initiatives in India to enable digital financial inclusion among BRICS nations [7]. By digitizing the books of accounts of the SHGs through a secured portal, the project standardizes the operations and record keeping of SHGs, improves transparency, and enables bankers to provide credit to SHGs based on online applications and an inbuilt grading system. Additionally, the project helps bankers identify non-linked groups for first-time credit and post-credit repayment management, making it a comprehensive solution to improve the financial inclusion of SHGs.

## 2. REVIEW OF LITERATURE

Microfinance and SHGs have been thoroughly researched in terms of their ability to reduce poverty and empower women. [8,9], have underlined the importance of microfinance in delivering financial services to the underserved population. SHGs are beneficial in encouraging collective action, social capital, and financial inclusion as community-based organizations [10]. Peer support and solidarity within SHGs have helped members increase their repayment rates

and financial discipline [11]. These studies show that microfinance and SHGs can promote inclusive development. However, various research studies have identified barriers to SHG financial inclusion. SHGs face challenges such as insufficient bank loans, loan delays, a lack of insurance, and investing in unsuitable areas [12]. SHG members may become overworked and malnourished due to a bank loan [13]. SHG federations, too, have weak financial management abilities, resulting in a low degree of financial sustainability [14]. SHG members must be taught to be financially self-sufficient by using loans for their firms [15,16]. SHG members cannot engage in relevant entrepreneurial activities due to a lack of or insufficient capacity-building initiatives [17]. Many SHG members who venture into entrepreneurship lack marketing abilities owing to a lack of sufficient training. As a result, they suffer significant financial losses, limiting their ability to promote livelihood through SHGs [18]. These difficulties highlight the importance of tailored initiatives to improve financial inclusion. Therefore, SHG digitization has gained popularity in recent years as a potential answer to the issues that these organizations confront. According to Badruddin [19,20], mobile banking and digital platforms allow SHGs to access financial services more quickly and effectively. The use of digital platforms has also resulted in enhanced record-keeping and transparency, which has contributed to improved financial management within SHGs [21]. Furthermore, through webinars and online workshops, SHG members may get training in product marketing, risk management, financial literacy, and group dynamics [22]. Aker et al. [23] conducted a randomized experiment to investigate the benefits of mobile money cash transfers in Niger. It was found that cash transfers to mobile accounts lowered the cost of obtaining money while simultaneously increasing women's negotiating power and household spending. To fully realize the promise of digitization, it is necessary to address digital literacy gaps [24,25] as well as concerns about data privacy and security. Correspondingly, in India, Project E-Shakti has been a pioneering initiative in digitizing SHGs. According to Keshava et al. [26], the E-Shakti project is still in its early phases, but the results and success stories have allowed the initiative to prove its pledge to digital empowerment and inclusive growth. There is still a long way to go in terms of digitalization, and safeguards should be made to ensure that digitalization does not empower humans but rather assists them in their

empowerment and general progress. Positive results have been reported in studies examining its influence, such as those by Mate et al. [27,28]. Through mobile banking services, E-Shakti has greatly enhanced financial access for SHGs [29], resulting in greater savings and credit uptake among members. Furthermore, digital financial services have improved women's empowerment and socio-economic standing [30]. However, E-Shakti's success is dependent on a strong digital infrastructure, proper technical skills, and institutional backing.

## 2.1 Statement of Problem

Despite several measures to empower women through SHGs, there is still a huge gap in these organizations' access to technology and digital competence. Needy and potential SHG members, especially women, are deprived of financial assistance, and as such, their well-being is hampered. Project E-Shakti, launched by the government, aims to bridge this gap by digitizing SHGs and providing them with the necessary technical infrastructure and training. The project's efficacy in reaching its targeted aims and its effects on the economic condition of women in SHGs have not been much explored. Therefore, the purpose of this study is to assess the impact of Project E-Shakti on SHG digitization and the economic status of women in these groups by examining growth in the level of SHG credit linkage, the amount of loan disbursed to them and the decline in the NPA of the SHGs. Furthermore, this study will look at the potential benefit of SHGs' digitization to Non-Banking Financial Companies- Microfinance Institutions (NBFCs-MFIs).

## 2.2 Objectives

1. To study the effectiveness of digitization in inclusive growth through microfinance.
2. To examine the benefits associated with the digitization of SHGs to NBFCs-MFIs.

## 3. METHODOLOGY

The study intends to examine the effectiveness of the digitization of SHGs and its associated benefits to NBFCs-MFIs. The data has been collected from a secondary source through the Status of Microfinance in India yearly report published by NABARD from 2007-08 to 2014-15 to gather data before the pilot project came into being and from 2015-16 to 2022-23 after the launch of the project. To check the effectiveness

of SHG digitization and its overall benefits, data on credit linkage, bank loan disbursed, bank loan outstanding, amount of NPA, and percentage of NPA has been taken into account. A trend analysis has been done to analyze the objectives, followed by a correlation analysis. Data on the number of districts covered and the number of groups covered has also been taken into account to examine the progress of project E-Shakti to date. The use of tables and graphs has been made to depict the data and progress of the various variables taken into account. Python Algorithm (using Jupyter Notebook) has been used for the analysis.

## 4. RESULTS AND DISCUSSION

### 4.1 Progress under Project E-Shakti

As of March 31, 2022, information on 12.74 lakh self-help groups (SHGs) comprising 146 lakh members from over 1.73 lakh villages in 281 districts has been digitized under Project E-Shakti as can be seen in Table 1. Additionally, starting July 1, 2021, data from 8.68 lakh SHGs in 130 districts across 15 states and one union territory is being updated monthly under a focused approach. The project has led to an improvement in credit linkages with banks. Before E-Shakti, 4.92 lacks (or 39%) of digitized groups had credit linkages, but as of March 31, 2022, that number has increased to 7.17 lakh (or 56%) post E-Shakti. SHG members also receive SMS alerts on their banking transactions in local languages, which has helped boost women's confidence in these groups. This demonstrates the success of digitization in SHGs, as well as their enhanced access to financial services. The programme was crucial in reducing SHGs' reliance on informal sources of financing.

### 4.2 Effectiveness of Digitization

Table 2 shows the data regarding the factors under the study for a period of sixteen years from 2007-08 to 2022-23.

As seen in Fig. 1, before project E-Shakti, SHGs credit linkage was not significant. Access to financing was a big issue for SHGs, especially those in rural and remote regions. These groups frequently struggled to get loans from official financial institutions due to a lack of collateral and proper documents. As a result, many SHGs relied on informal lending sources, which frequently imposed excessive interest rates and, in some circumstances, led to indebtedness and

financial difficulty. Following the project's implementation, the credit linkage of SHGs improved and significantly increased year-on-year except for the year 2020-21. The digitization of SHGs eased loan applications and disbursements while significantly lowering the cost of financing for these groups. SHGs could access formal credit at lower interest rates, improving their financial viability and decreasing their reliance on informal credit sources. The programme also encouraged banks to lend to SHGs by assuring them of prompt repayments via the digital network. It has enabled outreach to previously disadvantaged areas where access to formal financing was limited. The digital infrastructure supplied by project E-Shakti has enabled SHGs in rural locations to connect, hence extending their client base.

As seen from Fig. 2, prior to the initiative E-Shakti depicted through the blue line, the amount

of loans disbursed to SHGs was though increasing but was quite little. This mostly resulted from a lack of credit linkage between SHGs and mainstream banking institutions. The orange line shows that project E-Shakti has played a key impact in boosting the amount of loans given to SHGs. Project E-Shakti has increased SHG loan availability by digitizing SHGs and simplifying credit linkages to formal financial institutions. There is an increase of around 35 percent in loans disbursed from 2014-15 to 2015-16. The amount of loans disbursed is continuously increasing except for the year 2020-21, after which a huge increase was experienced in the amount of loans disbursed by around 72 percent. The e-Shakti programme has increased the creditworthiness of SHGs, allowing them to obtain greater loan amounts. This has enabled SHGs to grow their economic operations, invest in income-generating enterprises, and enhance their socio-economic standing.

**Table 1. Progress under project E-shakti**

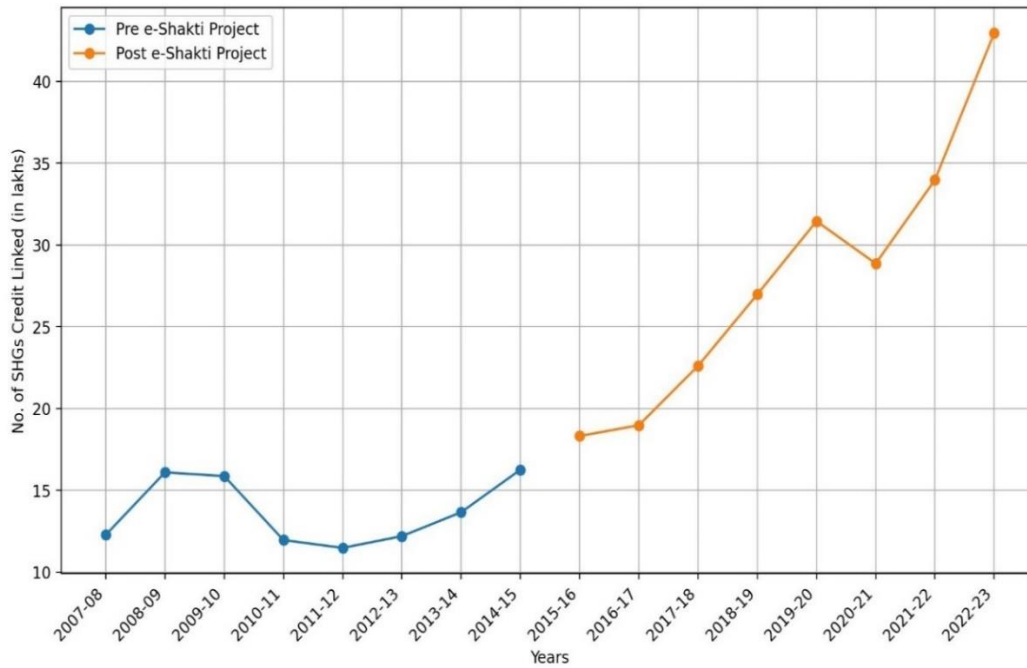
Year	Districts Covered	Groups Covered (in lakhs)
31.03.2016	2	0.08
31.03.2017	25	1.28
31.03.2018	100	3.49
31.03.2019	100	4.34
31.03.2020	254	6.44
31.03.2021	281	12.33
31.03.2022	281	12.74

Source: Compiled from Status of Microfinance report NABARD

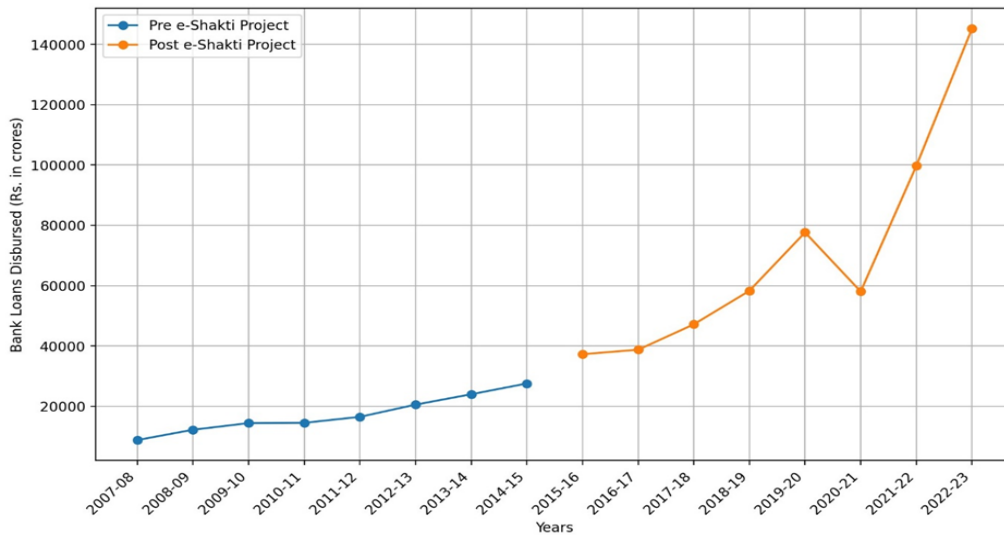
**Table 2. Factors considered to measure the effectiveness of digitization**

Year	No. of SHGs Credit Linked (in lakhs)	Bank Loan Disbursed to SHGs (Rs. in crores)	Bank Loan Outstanding Against SHGs (Rs. in crores)	Amount of NPA of SHGs (Rs. in crores)	Percentage of NPA to Total Loan Outstanding Against SHGs
2007-08	12.28	8849.26	16999.91	422.93	2.49
2008-09	16.10	12253.51	22679.85	625.86	2.76
2009-10	15.87	14453.30	28038.28	823.04	2.94
2010-11	11.96	14547.73	31221.17	1474.11	4.72
2011-12	11.48	16534.77	36340.00	2212.73	6.09
2012-13	12.20	20585.36	39375.30	2786.93	7.08
2013-14	13.66	24017.36	42927.52	2932.67	6.83
2014-15	16.26	27582.31	51545.46	3814.71	7.40
2015-16	18.32	37286.90	57119.23	3686.23	6.45
2016-17	18.98	38781.16	61581.30	4002.19	6.50
2017-18	22.61	47185.88	75598.45	4628.06	6.12
2018-19	26.98	58317.63	87098.15	4524.01	5.19
2019-20	31.46	77659.35	108075.07	5321.70	4.92
2020-21	28.87	58070.68	103289.71	4889.21	4.73
2021-22	33.98	99729.23	151051.30	5743.71	3.80
2022-23	42.96	145200.23	188078.80	5249.34	2.79

Source: Compiled from Status of Microfinance report NABARD



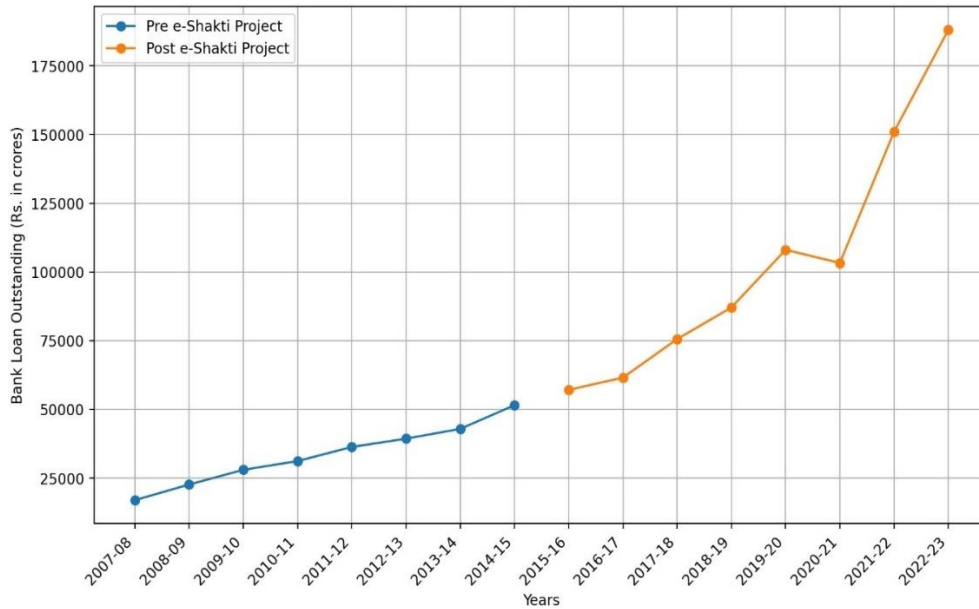
**Fig. 1. No. of SHGs credit linked over the years**  
 Source: Created using Python Algorithm



**Fig. 2. Bank loan disbursed to SHGs over the years**  
 Source: Created using Python Algorithm

Bank loan outstanding against SHGs depends upon the amount of loan disbursed to them and the repayment schedule. Since the amount of loan disbursed was continuously increasing, so was the amount of loans outstanding. The rate of rise before the project's inception Fig. 3-blue line was lower than the rate of increase after the project's inception Fig. 3-orange line. This was owing to a lack of credit and digital platforms, as

well as a lack of financial awareness and capacity-building among SHG members. The amount of loans outstanding against SHGs grew during Project E-Shakti, indicating greater credit access and increased economic activity. If SHGs have access to larger loans, they may be able to engage in income-generating firms, improve their well-being, and return their obligations on time.

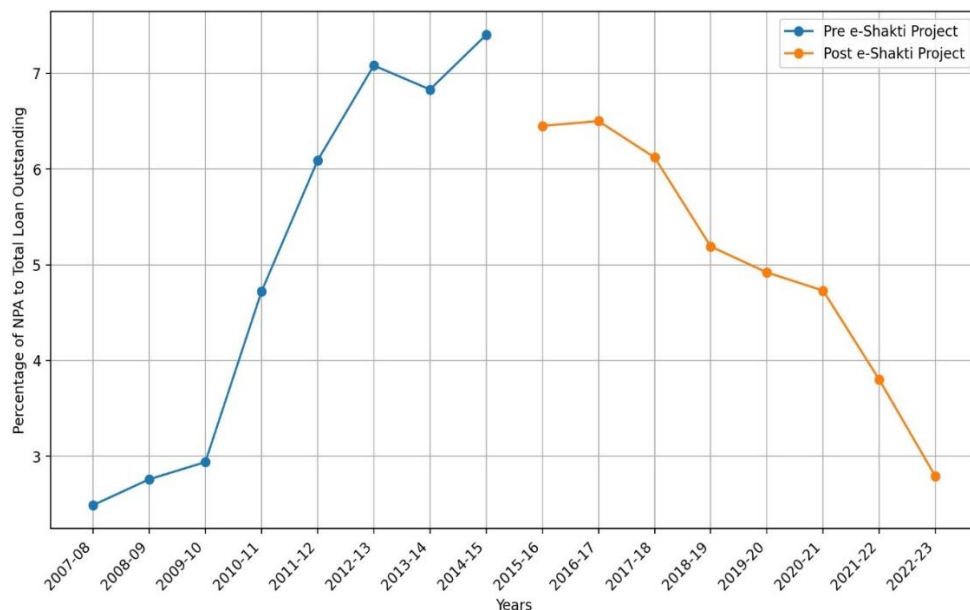


**Fig. 3. Bank loan outstanding against the SHGs over the years**

Source: Created using Python Algorithm

Prior to the implementation of project E-Shakti Fig. 4-blue line, the proportion of NPAs to total loans outstanding against SHGs was quite high and steadily growing. This was mostly owing to a lack of credit linkage and digital platforms, which made timely loan repayment difficult for SHGs. The lack of financial understanding and capacity-building among SHG members also contributed to a high NPA percentage. Project E-Shakti has

assisted in lowering the percentage of NPAs Fig. 4-orange line to the total loan outstanding for SHGs. SHGs can now keep track of their loan payments and avoid defaulting thanks to the digital platform. NPA reduction has helped both SHGs and their members and conventional financial institutions. It has lowered their credit risk and increased loan recovery rates, making it more appealing for them to lend to SHGs [31].



**Fig. 4. Percentage of NPA to total loan outstanding against SHGs over the years**

Source: Created using Python Algorithm

### 4.3 Compound Growth Rate for Pre-E-Shakti and Post-E-Shakti Periods

Table 3 shows the compound growth rate for the pre-SHG and post-SHG periods using exponential trends. The compound growth rate has been calculated using the formula:

$$CAGR = [(Final\ Value / Initial\ Value)^{1/Number\ of\ years}] - 1 \times 100\%$$

Period I related to the pre-E-Shakti period (2007-08 to 2014-15) and Period II related to the post-E-Shakti period (2015-16 to 2022-23). There is a significant increase in the number of SHGs credit linked in period II (11.24%). Similarly, the percentage increase in bank loan disbursed to SHGs and bank loan outstanding against SHGs were slightly high in period II as compared to the period I. There has been a sharp decline in the rate of increase of the amount of NPA (4.52%) in period II as compared to the period I (31.64%). In period I, the rate of increase of the percentage of NPA was 14.58%, which was significantly reduced in period II (percentage change is -9.95), meaning the percentage of NPA was significantly reduced in period II.

### 4.4 Refinance Disbursed by NABARD to NBFC-MFIs

Since 2014-15, NABARD has been providing financial assistance to MFIs through Long Term Refinance support to qualified NBFC-MFIs, as mentioned in Table 4. The refinancing given to NBFCs-MFIs showed a volatile pattern Fig. 5 following the commencement of the pilot project E-Shakti. In the early years of the initiative, there was continuous growth in refinancing given to NBFCs-MFIs, signifying that project E-Shakti had a favorable influence on the microfinance industry. However, there was a sharp decline in refinance disbursed to NBFCs-MFIs in 2017-18, which could be attributed to factors such as demonetization and the introduction of the Goods and Services Tax (GST) system in India. In November 2016, the Indian government decided to demonetize high-value currency notes which had a substantial impact on the microfinance business [32], since it interrupted financial flows and impacted microfinance clients' capacity to repay their loans [33]. This may have resulted in a decrease in demand for microfinance and a reduction in the requirement for refinancing from formal financial institutions. Also, the adoption of the GST in India might be one cause for the substantial fall in loans issued to NBFCs-MFIs in

2017-18. The introduction of the GST in July 2017 resulted in major changes in the tax structure and compliance requirements for businesses, including microfinance institutions [34]. The inclusion of GST increased compliance costs for microfinance institutions, potentially affecting their operations and financial performance. This might have resulted in a decline in demand for refinancing by NBFCs-MFIs. In 2020-21, the increase in the refinance facility was due to the RBI providing NABARD with an additional standing liquidity facility of Rs. 5000 Crore for one year at the RBI's policy repo rate. This was aimed at refinancing NBFC-MFIs and smaller NBFCs with asset sizes of INR 500 crore and less to support agriculture, allied activities, and the rural non-farm sector in response to the Covid-19 pandemic. There is a sharp decrease in the year 2022-23 due to the changes in the guidelines for lending by the NABARD to NBFC-MFIs. The guidelines were made stringent and there was an increase in the interest rate, which resulted in a decrease in the amount of the refinance disbursed in 2022-23 (Circular No. 68 / DoR - 21 / 2022, available on NABARD's website [www.nabard.org](http://www.nabard.org) under the tab information Centre).

The Covid-19 pandemic has had a substantial influence on the microfinance sector [35], including credit linkage of SHGs, loan disbursement, loans outstanding against SHGs, and the rate of NPA to total loans outstanding against SHGs. Due to the economic slowdown caused by the pandemic, many SHGs were unable to meet their loan repayment obligations [36], leading to a decrease in the number of SHGs credit linked and the amount of loan disbursed. According to data from the NABARD Status of Microfinance (2020-21) report, the number of SHGs credit linked decreased from 31.46 lakhs in 2019-20 to 28.87 lakhs in 2020-21, an 8 percent decline. Similarly, the amount of credit disbursed to SHGs decreased by roughly 25.2 percent from INR 77,659.35 crore in 2019-20 to INR 58,070.68 crore in 2020-21. The amount of loans outstanding against SHGs has also decreased, falling from INR 1,08,075.07 crore in 2019-20 to INR 1,03,289.71 crore in 2020-21, a 4.4 percent decrease.

### 4.5 Correlation of Factors Considered for the Study

Table 5 shows that the no. of SHGs credit linked, loan disbursed, loan outstanding, and the amount of loan are significantly correlated to each other, indicating that as the no. of SHGs



credit linked increases, loan disbursed to them also increases and so does the increase in loan outstanding and amount of NPA. All these variables were highly significant ( $P < 0.01$ , 2-tailed). The highest correlation is between loan disbursed and loan outstanding (0.991), which is attributable to the fact that as the loan disbursement increases, there is a corresponding increase in loan outstanding because of various reasons such as accumulated interest, longer loan tenures as new borrowers are added, delayed repayments and roll-over of existing loans. The correlation between the number of

SHGs credit linked and loans disbursed and loans outstanding against SHGs is also very high (0.969 & 0.969, respectively). The reason could be the increase in the number of SHGs credit linkage due to digitization leading to the increase in demand for loans, thus, a higher volume of loan disbursement and loan outstanding. The percentage of NPA is negatively correlated to other factors because the amount of all other factors considered was increasing due to the implementation of project E-Shakti except for the percentage of NPA which was decreasing and which is a good indicator.

**Table 3. Compound growth rates (Exponential Trend)**

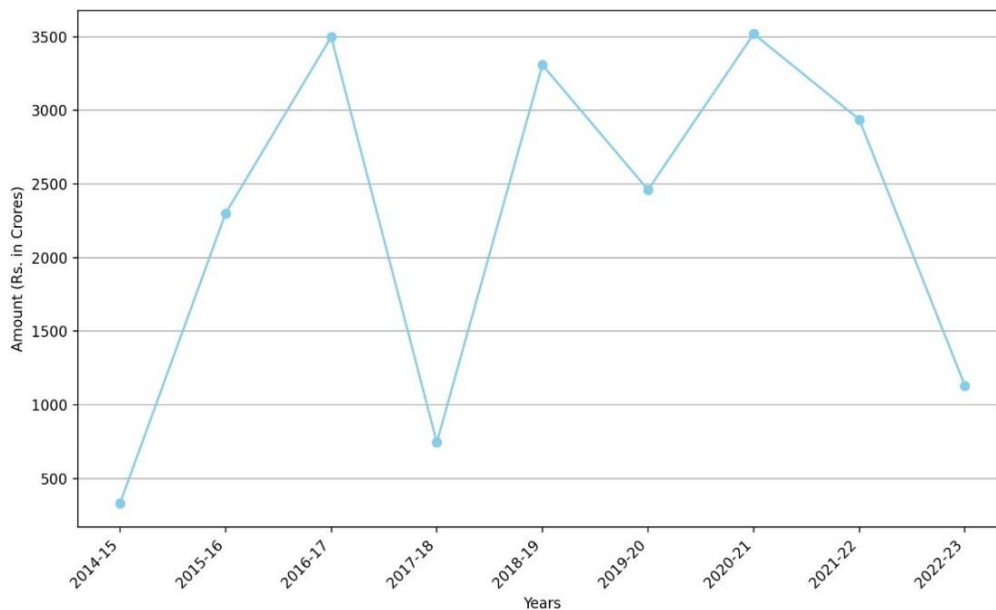
Indicators	Over period (2007-08 to 2022-23)	Period I (2007-08 to 2014-15)	Period II (2015-16 to 2022-23)
No. of SHGs credit linked	8.14	3.75	11.24
Bank Loan Disbursed to SHGs	19.11	15.27	18.52
Bank Loan Outstanding	16.21	14.87	16.06
Amount of NPA	17.05	31.64	4.52
Percentage of NPA	0.71	14.58	-9.95

Source: Computed by Authors using CAGR formula

**Table 4. Refinance Disbursed to NBFC-MFIs**

Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Amount (Rs.) (in Crores)	330	2300	3498	744	3308	2460	3519	2938	1130

Source: Compiled from Status of Microfinance report NABARD



**Fig. 5. Refinance Disbursed to NBFC-MFIs**

Source: Created using Python Algorithm

**Table 5. Correlation among factors considered**

Factors	No. of SHGs Credit Linked	Loan Disbursed to SHGs	Loan Outstanding Against SHGs	Amount of NPA	Percentage of NPA to Total Loan Outstanding
No. of SHGs Credit Linked	1				
Loan Disbursed to SHGs	.969**	1			
Loan Outstanding Against SHGs	.969**	.991**	1		
Amount of NPA	.793**	.780**	.843**	1	
Percentage of NPA to Total Loan Outstanding	-.332	-.249	-.205	.283	1

\*\* Correlation is significant at the 0.01 level (2-tailed)

Sources: Computed using Python Algorithm

#### 4.6 Correlation Between Pre-E-Shakti and Post-E-Shakti Period

H<sub>01</sub>: There is no significant correlation in the no. of SHGs credit linked, loan disbursed to SHGs, loan outstanding against SHGs, amount of NPA, and percentage of NPA to total loan outstanding during the post-E-Shakti period as compared to the pre-E-Shakti period.

Table 6 shows the correlation between pre-E-Shakti and post-E-Shakti period of factors considered for the study. Since the correlation coefficient for no. of SHGs Credit Linked pre-E-Shakti and no. of SHGs Credit Linked post-E-Shakti period is 0.095, we fail to reject the null hypothesis, thereby stating that there has been a

significant change in the no. of SHGs credit linked post the E-Shakti period. The correlation coefficient for pre-E-Shakti and post-E-Shakti period for factors namely, loan disbursed, loan outstanding, amount of NPA, and percentage of NPA is significant at a 1% level of significance, we reject the null hypothesis, thereby inferring that in the post-E-Shakti period, loan disbursed, loan outstanding, and the amount of NPA were increasing almost equivalent to that of the pre-E-shakti period, except for the percentage of NPA as there is a negative correlation in pre and post-E-shakti Period which means that in the post-E-Shakti period, the percentage of NPA reduced significantly. These results are also evident in Table 3 of the compound growth rate.

**Table 6. Correlation of Pre-E-Shakti and Post-E-Shakti Periods**

	No. of SHGs Credit Linked Post-E-Shakti	Loan Disbursed Post-E-Shakti	Loan Outstanding Post-E-Shakti	Amount of NPA Post-E-Shakti	Percentage of NPA Post-E-Shakti
No. of SHGs Credit Linked Pre-E-Shakti	0.095				
Loan Disbursed Pre-E-Shakti		0.906**			
Loan Outstanding Pre-E-Shakti			0.953**		
Amount of NPA Pre-E-Shakti				0.840**	
Percentage of NPA Pre-E-Shakti					-0.919**

\*\* Correlation is significant at the 0.01 level (2-tailed)

Source: Computed using Python Algorithm

## 5. CONCLUSION AND SUGGESTIONS

- Before E-Shakti, rural and remote SHGs had trouble getting financing. These groups have trouble getting loans from banks due to a lack of collateral and paperwork. As a consequence, many SHGs used informal financing sources, which charged high interest rates and caused debt and financial difficulty. SHGs received digital infrastructure and training under the E-Shakti project to interface with banks online.
- Digitization simplified SHG loan applications and disbursements and greatly reduced financing costs. SHGs were assured rapid returns via the digital network to attract banks to lend.
- By comparing various indicators of the study, such as the number of SHGs credit linked to formal financial institutions, loans disbursed, loans outstanding, and the percentage of NPAs to total loan outstanding against SHGs, it was found that project E-Shakti led to an improvement in the number of SHGs credit linked significantly and the amount of loan disbursed to them. As a result, the amount of loans outstanding and the amount of NPA also increased but the rate of increase of NPA was reduced. Also, the percentage of NPAs to total loans outstanding against SHGs decreased.
- The post-E-Shakti period exhibited similar trends to the pre-E-Shakti period in terms of loan disbursed, loan outstanding, and amount of NPA while witnessing a significant reduction in the percentage of NPA.
- It was also unveiled that the project E-Shakti helped not only SHGs and its members but also the financial institutions. NBFCs-MFIs got refinance facilities from NABARD starting the year when project E-Shakti was launched, and subsequent significant volatility in the amount of refinance disbursed to these institutions was observed.
- A small downfall in the number of SHGs credit linked and loans disbursed was observed in the year 2020-21, which is attributable to the Covid-19 pandemic. However, the pandemic did not hinder the sector's progress, and the sector overcame the challenges and problems caused by the pandemic with the combined efforts of its participants.

- Project E-Shakti has allowed SHGs to expand their economic activities, invest in revenue-generating ventures, and improve their socio-economic position. Overall, the inclusive growth of microfinance and its members through the digitization of SHGs was found.
- To boost the number of credit-linked SHGs, Project E-Shakti should be expanded to include additional regions and places, notably remote and underserved or unbanked areas. This would entail a more extensive outreach strategy, as well as the provision of necessary infrastructure and training to SHGs in these areas.
- Regular training programmes on the use of digital technology for SHGs and NBFCs-MFIs should be implemented to guarantee the efficiency of digitization in the inclusive growth of microfinance. This will increase SHG members' digital literacy and the effectiveness of NBFCs-MFIs in managing digital transactions.
- NBFCs-MFIs must strengthen their credit evaluation systems to lower the proportion of NPAs to total loans outstanding. This would entail completing extensive credit assessments, advising SHGs on loan utilization, and periodically monitoring loan repayments.

## 6. RECOMMENDATIONS

- Project E-Shakti has given SHGs digital infrastructure, but it has to be reinforced for stability and accessibility. Improved internet access, frequent digital equipment maintenance, and user-friendly digital platforms are instances.
- SHGs must be tech-savvy to use digital technologies. SHG members' digital skills should be improved via frequent training and capacity-building. These programs may include digital financial literacy, internet marketing, and e-commerce.
- Since Project E-Shakti has linked SHGs to credit, additional partnerships with mainstream financial institutions are possible. Giving banks incentives to lend to SHGs, speeding up loan applications and disbursements, and improving credit assessment procedures may help.
- Project E-Shakti's influence on SHGs must be constantly assessed to determine its success and areas for development. For doing so, track of the number of SHGs that have been digitized should be kept, the

amount of credit that has been granted, and the socio-economic impact on SHG members should be analyzed.

- The scope of Project E-Shakti should be expanded to include digital healthcare, education, and governance. This could include offering digital healthcare services to SHG members, expanding access to digital education, and promoting e-governance initiatives.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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