

Review Article

Navigating the Watershed: Challenges and Opportunities for Women's Empowerment in Rural Development

ABSTRACT

Women empowerment in rural development encompasses economic, social, human, and legal dimensions, aiming to enhance women's quality of life and capacity as agents of economic progress. This review evaluates women's empowerment within the context of watershed development programs implemented through Self-Help Groups (SHGs) in India. Watershed initiatives focus on sustainable resource management, integrating participatory approaches to build community resilience and address socio-economic disparities. SHGs emerge as pivotal mechanisms, fostering social cohesion, enhancing financial literacy, and enabling women to engage in income-generating activities. However, systemic barriers—such as entrenched gender norms and limited institutional support—challenge their scalability and inclusivity. The study underscores the need for gender-sensitive policies, combining hard and soft adaptation strategies to maximize community engagement and equity. Highlighting successful SHG-driven models and participatory evaluation frameworks, this paper provides actionable insights to enhance women's roles in sustainable watershed governance and rural innovation systems.

Key words Self-Help Groups, Watershed, Empowerment, Social mobility, Women participation, Gender inequality

INTRODUCTION

Women Empowerment in Rural Development

Women empowerment in rural development is defined as the process of improving women's capacity for strategic life choices and raising their access to economic resources, social freedoms, and legal rights (Sharma & Das, 2021). It is a multi-dimensional concept involving economic, social, human, and legal aspects with the aim of quality life and capacity of women as human resources for economic development (Pal et al., 2021).

1. This leads to an improvement in the quality and quantity of human resources for economic development (Pal et al., 2021).
2. It leads to poverty alleviation as more than 80% of the world's poor population resides in rural areas, and women make up 70% of that population (Gupta et al., 2024).
3. Empowered women will effectively be able to engage in more income-generating activities and micro-enterprises. These jobs create employment opportunities, thereby improving incomes, and this will boost their purchasing powers for their economies. (Arul Paramanandam&Packirisamy, 2015)
4. Environmental conservation, a fundamental function women play that is critical in sustainable rural development, states Ghasemi et al., (2021).

While quantitative data frequently reflect moderate to strong collective efficacy, proactive attitude, self-esteem, and self-efficacy among working women, qualitative data reflect both appraisals of positive assessments of worth and independence on the one hand and of pressure and stress on the other hand (Moyle et al., 2006). It reflects the complexity behind the issue of women empowerment and a call for well-rounded approaches in rural development plans. Watershed development programs are holistic interventions that deal with the management and conservation of natural resources, especially water and soil, in identified drainage areas or watersheds. From infrastructure-based approaches, the programs have developed into participatory processes in building rural adaptive capacity and mitigating risks of climate change (Singh, 2017).

The primary objectives of watershed development programs include:

1. Strengthening natural resource-based livelihoods in semi-arid areas (Singh, 2017)
2. Conserving reservoir water quality and optimizing land use for economic benefits (Chang et al., 1997)
3. Soil and water conservation measures have been implemented to mitigate erosion and sedimentation (Alemu, 2016)
4. Developing area-specific plans for sustainable water resource management (Chowdary et al., 2008)
5. Integrating the ecological, social, and economic aspects of watershed management (Wang et al., 2016)

Although watershed development programs have been designed to be participatory and community-led, effectiveness in enhancing local adaptive capacity has not always met the intentions. In fact, community participation has been reported to reinforce existing power hierarchies, thus raising issues about who benefits. The objective of watershed development programs is to balance environmental conservation with economic development through integrated approaches. However, attaining their goals is reliant on several determinants: integrating rigid and flexible adaptation methodologies, active involvement by the community, and reducing big issues such as corruption and policy priorities (Singh, 2017; Wang et al., 2016).

Conceptual Model: SHGs and Women's Empowerment

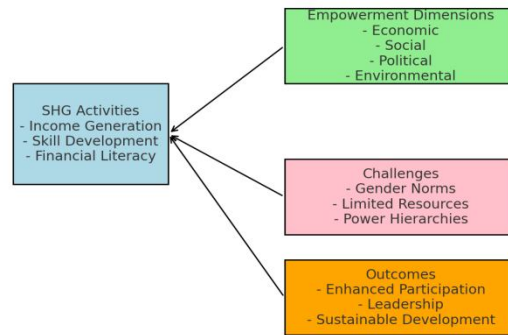


Fig 1- Conceptual framework

SELF-HELP GROUPS AND ITS EMPOWERMENT

Self-help groups are membership-based organizations meant to support bringing social integration and community development through integrated educational programs, accessibility of finance, and contact of other development programs (Desai & Joshi, 2013). The group comprises mainly women who have emerged in recent times as popular conduits of development projects in the majority of low- and middle-income countries, particularly across South Asia and sub-Saharan Africa (Gugerty et al., 2018). SHGs perform a wide set of functions in community development. The groups began initially as savings and credit groups. However, over the periods, their functions began expanding to include health and nutrition awareness, improving governance, and all types of issues related to gender- and caste-based discrimination (Kumar et al., 2021). Microcredit initiatives have mainly contributed to reducing poverty and unemployment in rural India; apart from this, such organizations have achieved women's empowerment in the economic and social spheres (Alrefaei et al., 2022). Local governance and delivery of public goods also are impacted by SHGs. Studies have shown that SHGs collectively undertake activities related to public goods provision in rural communities, which leads the elected representatives to focus more efforts on addressing the issues at hand (Casini et al., 2015). It is worth noting that, although SHGs have been found to primarily result in positive impacts on many developmental outcomes, evidence to date is limited and scarcely compares the effectiveness of SHGs relative to other delivery mechanisms (Gugerty et al., 2018).

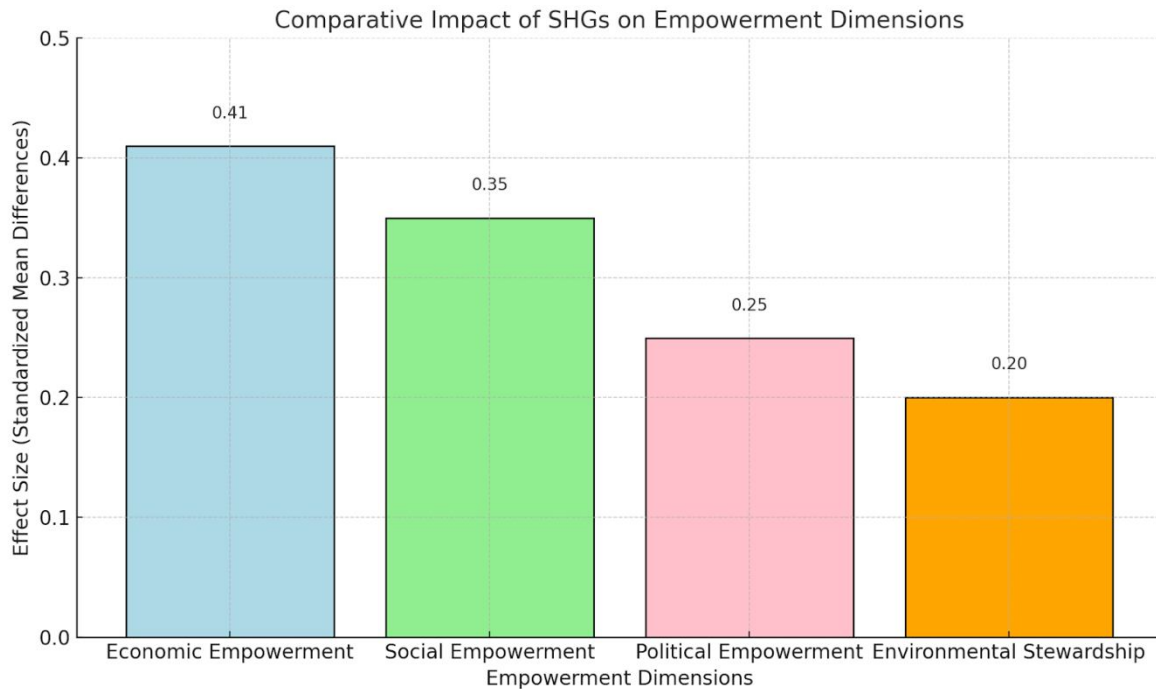


Fig 2- Comparative impact of SHGs on empowerment dimensions

Economic Empowerment

Self-help groups have been found to benefit the income-generating activities of women remaining in rural areas. Increased involvement of women with SHGs increases their activity in group savings and other non-agricultural sources of employment (Desai & Joshi, 2013). Prolonged tenure of membership in SHGs leads to positive asset accumulation along with the diversification of income sources from agriculture like other income sources from livestock production (Swain & Varghese, 2009). Self-help groups allow women to access collective action that seeks improved provision of public goods to their local communities (Casini et al., 2015).

Self-Help Groups (SHGs) are generally linked with positive changes in economic empowerment; however, their effects on income are unclear. Desai and Joshi (2013) found no evidence of increased income or an uneven effect on the socio-economic status of women. Conversely, Brody et al. (2016) reported positive effects related to economic empowerment, with standardized mean differences ranging from 0.06 to 0.41. Such differences may be attributed to variations in study design, context, or specific SHG models used.

SHGs are apparently sound means of generating income for the rural woman. Apparently, they offer easy access to finance, training, and social networks that can spur diversification of income-generating sources and asset creation. Of course, again, how this translates to a concrete improvement in income depends on the model, the duration of membership, and other contextual factors specific to that setting. Thus, research on which of the various models of SHGs really spurs incomes best should continue.

Access to credit and savings is one of the very critical components of financial inclusion and economic development, especially for smallholder farmers and micro-entrepreneurs in developing countries. Studies have shown that mobilization of savings has a positive significant impact on access to credit and the total amount of credit one can borrow (Ankrah Twumasi et

al., 2019). Similarly, savings accounts are a significant factor that can influence the ability of households to access credit (Baffoe & Matsuda, 2015). Access to credit can be beneficial; it may also have adverse effects on financial stability if not properly managed. In fact, inclusion through access to payments and savings accounts is found to have a neutral or positive effect on financial stability. On the other hand, access to credit may weaken financial stability if credit growth occurs without due regard to borrower ability-to-repay (Feghali et al., 2021). This finding stresses the need for responsible lending and financial literacy. Improving access to credit and savings has significantly positive impacts on economic development, especially for underserved populations. However, it is important to do this responsibly, in tandem with financial literacy programs. For example, a study in Ethiopia found that combining SMS reminders with financial literacy training improved financial literacy scores and increased short-term bank deposits in banks (Abebe et al., 2018). Such integrated approaches can help maximize the benefits of financial inclusion while mitigating the potential risks to financial stability.

Financial literacy and management skills are the backbone of any successful Self-Help Group in India. SHGs, mainly women, are important platforms for delivering development activities and microfinance services. Financial literacy among SHG members is important for the management of group funds, better decision-making, and contributing toward the growth of the community (Casini et al., 2015; Nichols, 2021). The research findings also indicate that financial literacy increases investment choices and conducts within financial activities. Financial literacy has a huge impact on the investment decisions of these undergraduate students. Financial skills are a constituent part that is considered the most important among such literacy for undergraduate students (D.A.T, 2020). Another similar study of Vietnamese adults presented results indicating that higher incomes are positively related with proper savings practices and financial planning in general (Van Nguyen et al., 2022). The relationship between financial literacy and financial conduct is not intuitively direct. Studies by Dewi et al. (2020) revealed significant relationships with attitudes towards finance, financial skills, and the financial handling behavior of millennials; yet no relationship between financial literacy and financial conduct was established. This means that practical knowledge and attitudes are likely to dominate theoretical understanding in shaping conduct towards finance. Hence, the improvement in the financial literacy and management abilities of the members of SHG is of crucial importance to their success and to community building. Since SHGs operate together to provide public goods and influence local government action (Casini et al., 2015), progress in financial skill yields better resource management and even more positive outcomes for both the groups and communities. Future interventions should include training in practical financial management and good attitudes toward personal finances among SHG members to achieve maximum potential as agents of change in rural Indian communities.

Social empowerment

The authority of women in making decisions within both domestic and communal settings represents a vital component of social empowerment, carrying substantial consequences for a range of outcomes. Many studies have explored this subject in diverse contexts, discovering noteworthy findings. Evidence indicates that an enhancement in women's decision-making power correlates with favorable results in areas such as health, education, and community advancement. A study conducted in Taiwan found that the prevalence of postpartum depressive symptoms in both immigrants and non-immigrants is negatively associated with greater domestic decision-making power (Chien et al., 2012). Participatory intrahousehold decision-making in Uganda enhanced women's participation in critical agricultural and household decisions, which received widespread women's acceptance and improved their well-being in the

household (Lecoutere & Wuyts, 2020). Women's empowerment has spillover effects beyond the individual household. In India, a study revealed that a women's empowerment program not only increased the trust and contributions to community projects among the participants but also had a spillover effect on the non-participating households in the same villages (Janssens, 2010). This means that women's empowerment can benefit the entire community. Therefore, empowering women in both household and community decision-making authority is an important part of social empowerment. However, there are still challenges that exist, especially in the areas of deeply ingrained social norms and gender inequalities, even though several interventions and policies have led to significant progress. Future programs should focus on more holistic approaches that combine economic empowerment with structural barriers and engage men and community members in challenging existing norms (Beaujoin et al., 2021).

It has been observed that women face various challenges in becoming and attaining a position as effective leaders in management levels of various industries (Hoyt, 2010). Elements that sustain the phenomenon known as the "leadership labyrinth" or "glass ceiling" include gender stereotypes, biases, and discrimination. In the context of watershed committees, these factors can act as barriers to women's participation and progression into leadership roles.

The collaborative leadership models, which would have been expected to reduce the gender gap in leadership influence, have not proven effective in doing so (Mendez & Busenbark, 2015). This evidence implies that even in such collaborative settings as watershed committees, additional efforts might be required to ensure equal participation and opportunities for women in leadership. Although there are no specific studies on the leadership of women in watershed committees, general literature shows that providing women with such positions must involve the removal of systemic constraints and targeted approaches. Training to recognize gender inequalities can be part of this package, as well as ensuring formal assignment of leadership so that participation is equal between genders, and creating friendly organizational cultures (Hoyt, 2010; Mendez & Busenbark, 2015). Further studies may be carried out to examine the applicability of these findings in watershed committees and determine effective ways to enhance women's leadership in these crucial community-based environmental management frameworks.

Social enterprises and organizations play a significant role in promoting women's social empowerment. In a Zapotec indigenous community in Mexico, a social enterprise implemented mechanisms, such as job stability and gender-equality policies, which triggered economic empowerment for women (Maguirre et al., 2016). The improvement of economic empowerment led, in turn, to a higher likelihood of women being involved in political and decision-making management, hence creating an incentive for more and more women in the society to seek employment and participate socially. Education has been cited as one of the determinants for women's social mobility and interaction. It equips women to face challenges, defy societal norms, and improve their status within families, societies, and the politico-economic systems (Jaysawal & Saha, 2023). It plays a vital role in the promotion of equality and the active involvement of women in all dimensions of life. A study done in rural Iran indicated the relevance of social determinants to women's empowerment. It is evident that social determinants such as the roles that women play in their families, the behavior of husbands, and their involvement determine the efforts to protect the environment (Ghasemi et al., 2021). This outcome suggests that increased social status and social networking may lead to a greater number of positive impacts within the community. The social empowerment of women, facilitated by increased mobility and increased social networking, is intricately linked with several factors, including economic opportunities, educational achievement, and favorable social contexts. These elements work in conjunction to build a situation in which women are

involved at all levels of decision-making, engaged in local projects, and contributing toward general societal goals, thereby ensuring balanced and sustainable development.

Political Empowerment

Political empowerment of women is a multi-dimensional concept that involves various participation and entitlements of women in the political sphere. It includes aspects such as civil liberties of women, participation in civil society, and participation in politics (Sundström et al., 2017). The process that creates basic capabilities, legal rights, and involvement in important social, economic, political, and cultural fields may be considered a definition of women's political empowerment (Moghadam & Senftova, 2005). This includes the aspect of women in political offices, their involvement in decision-making organs, and the ability of women to influence policy issues (Bitoto & Ongo, 2024; Wolak, 2019). This also includes access and participation of women in cultural institutions and the decision-making systems within them (Moghadam & Senftova, 2005).

The 73rd Constitutional Amendment Act instituted a framework for reservation. The law stipulated that one-third of the total seats in local governing bodies had to be reserved for women. This was an initiative that aimed at increasing women's participation in decision-making procedures and to rectify gender disparities in political representation (Chhibber, 2002). The role of women in watershed development governance frameworks is crucial for efficient and fair water resource management, particularly on issues of climate change adaptation. CBNRM strategies, such as watershed councils, open up avenues for enhanced local involvement in decision-making procedures (Lurie & Hibbard, 2008). However, women often face significant barriers that limit their effective participation in these governance bodies, although they are more adversely affected by matters related to water (Figueiredo & Perkins, 2012). The involvement of women in water governance is essential for ethical and practical reasons. Women provide vital local ecological, social, and political information that can significantly improve strategies targeted at adapting to climate change (Figueiredo & Perkins, 2012). However, there exists a difference between the institutional framework created to ensure the participation of women and the dominant social institution that controls the management of resources at the grassroots level (Singh, 2007). This gap can lead to challenges in achieving actual participation by women since the new institutional models may not represent the bottom-up system. These challenges can be addressed through community-based environmental education and capacity-building programs that promote equal participation of women in issues regarding climate change adaptation and water policy-making (Figueiredo & Perkins, 2012). Sister Watersheds project and Climate Change Adaptation in Africa project are but a few examples of the effectiveness of global partnerships in engaging grassroots political frameworks, most notably for women (Figueiredo & Perkins, 2012). In addition, empirical studies show that developmental programs that involve women can increase the participation of women in local governance and community engagement; however, these developmental programs cannot change the traditional gender roles in household-level decision-making (Beath et al., 2012). To increase the legitimacy and effectiveness of the role of women in local water governance, participatory models should be designed more appropriately in community-based institutional frameworks (Singh, 2007).

It is evidenced that the participation of women in watershed management has positive implications. Evaluating the Village Watershed Model in Indonesia found that gender-related

issues received the lowest scores relative to the other components of watershed management, which gives a room for increasing involvement of women (Sriyana et al., 2020). Similarly, a study that concentrated on watershed management organizations in Iran found that only one-third of the respondents were women, which indicates gender inequality in decision-making roles (Rezaei-Moghaddam & Fatemi, 2023). Additionally, research carried out in the Pacific region indicates the significant economic impact related to women's participation in fisheries, which accounts for 56% of annual small-scale catches and generates considerable income (Harper et al., 2012). This points out the potential economic benefits of women's engagement in watershed management. There are several strategies that are recommended to enhance women's participation. Empowering women through women's organizations could trigger development, as experienced in the case study for Cuetzalan del Progreso, Mexico by Durán-Díaz et al., 2020. Further, inclusion of both hard and soft adaptation strategies in watershed initiatives can focus on the establishment of inclusive institutions and encouragement towards sustainable resource utilization to deal with gender-based hierarchies effectively while enhancing the participation of women (Singh, 2017). The formulation of policies, reduction of poverty, and promotion of sustainable development rely on the acknowledgment and measurement of contributions of women toward watershed management (Harper et al., 2012).

In light of the discussion presented, a dearth of information clearly indicates the lack of women's rights and interests in the general context of advocating for the development of a watershed. However, this paper does find some insights that could be helpful, as a whole, for understanding wider discourse concerning gender equality and the empowerment of women within the context of development. Advocacy aimed at enhancing women's rights within development frameworks, including watershed initiatives, necessitates a human rights-oriented strategy that acknowledges various facets of empowerment—namely, economic, political, legal, sexual, and reproductive dimensions (Sen & Mukherjee, 2014). A mere concentration on limited indicators, such as differences in education, proves inadequate. Organizations dedicated to women's issues are vital in championing a holistic understanding of rights and advancing beyond traditional methods of achieving gender equality (Sen & Mukherjee, 2014). However, women TANs are probably unlikely to be effective in pushing further gender-mainstreaming strategies. Their resource scarcity and institutional advocacy over-emphasis may limit their capacities to politicize gender matters (Lang, 2009). This means that the advocacy of women's interest in watershed development also has similar capacity limitations. This will be more sensitive and place-based with regard to understanding and measuring gender equality and economic empowerment, especially in contexts where large informal economies and gendered divisions of labor persist (Mckinnon et al., 2016). Watershed development could mean this: recognising the role of women in water management and unpaid care work in relation to access to water. Effective advocacy for women's rights in watershed development would be the empowerment of local women's organizations, the adoption of rights-based frameworks, and the development of context-specific understandings of gender dynamics in water resource management. However, advocacy could be constrained by resource and institutional barriers.

Environmental Stewardship

Environmental stewardship is broadly defined as actions taken by individuals, groups, or networks to protect, care for, or responsibly use the environment in pursuit of environmental and/or social outcomes (Bennett et al., 2018). His definition is gender-neutral and applies to all individuals, including women. The concept encompasses a wide range of motivations and levels of capacity, operating in diverse social-ecological contexts. Women play a crucial role in natural resource management, and numerous studies have highlighted the benefits of their inclusion.

Research shows that women's participation in community forests and land use management leads to improved resource governance and conservation outcomes (Espada & Kainer, 2023; Leisher et al., 2016). In the Himalayan region, women's increased involvement due to male out-migration has contributed to their social, economic, and political empowerment, as well as improved natural resource management (Tiwari & Joshi, 2016). Although women's contributions are significant, they often face barriers to full participation. In many cases, women have restricted ownership of natural resources and limited access to developmental opportunities (Tiwari & Joshi, 2016). The shift from customary tenure systems to private property has affected women's rights to land, trees, and water, impacting their ability to engage in collective action for resource management (Meinzen-Dick et al., 1997). In the Pacific, there is a lack of gender-disaggregated data, leading to unquantified female contributions to ocean management (Michalena et al., 2019). Empowering women in natural resource management can lead to better resource governance, conservation outcomes, and sustainable development. Studies from India and Nepal provide strong evidence to support this claim (Leisher et al., 2016). To achieve effective and inclusive management, it is necessary to address gender-based discriminatory attitudes, improve women's access to resources and decision-making power, and collect gender-disaggregated data (Espada & Kainer, 2023; Harper et al., 2012; Michalena et al., 2019). Recognizing and quantifying women's roles in natural resource management has profound implications for management, poverty alleviation, and development policies (Harper et al., 2012).

Traditional ecological knowledge (TEK) plays a crucial role in sustainable land management and conservation efforts, with women often serving key knowledge holders and transmitters. However, the integration of TEK into modern practices faces challenges and opportunities. Women's involvement in TEK preservation and application of TEK is evident in several contexts. In the Pyrenees, pastoralists, including women, possess extensive knowledge of terrain, climate, vegetation, and animal behavior that could inform sustainable pasture management and adaptation strategies (Fernández-Giménez & Fillat-Estaque, 2012). Similarly, in Hawaii, TEK systems are seen as the basis for social resilience, with women playing an important role in knowledge transmission and cultural identity preservation (McMillen et al., 2016). Many studies have focused on the erosion of TEK, some cases have demonstrated successful adaptation and hybridization of knowledge. For instance, in New Zealand, traditional approaches to seabird harvesting by Rakiura Maori, including women's participation, continue alongside modern techniques, fostering a strong conservation ethics (Moller et al., 2009). This highlights the potential for integrating TEK with contemporary practices. Women's role in TEK integration is crucial for sustainable urban development and heritage preservation. Projects led by women in Qatar and Bahrain demonstrate how female leadership can contribute to revitalizing heritage, creating gender-sensitive public spaces, and implementing sustainable development practices (Grichting Solder & Alfaraidy, 2024). These initiatives not only fulfill indicators related to women's empowerment and sustainability, but also inspire and educate the next generation of female designers and cultural influencers, showcasing the potential for women to drive positive changes in urban environments while preserving traditional knowledge.

Women play a crucial role in sustainable agricultural practices and contribute significantly to food security, environmental conservation, and rural development. Research indicates that women are up to three times more likely to be farm operators in sustainable agricultural models than in productivist models (Trauger, 2004). This shift challenges traditional gender identities on farms and provides space for empowerment for female farmers. In developing countries, women's participation in agriculture poses unique challenges. For instance, in Bangladesh, neoliberal agrarian policies and capitalist patriarchy have led to a

decline in women's agricultural involvement (Rahman et al., 2023). Similarly, in Burundi, gender gaps persist in the access to and use of climate-smart agricultural practices, with women being the most vulnerable (Nchanjiet al., 2023). However, joint decision-making, access to information, and collective action in groups have been shown to reduce these gender gaps. Young female farmers often show higher concern for environmentally friendly farming practices than their male counterparts (Unay-Gailhard&Bojnec, 2021). This sensitivity to environmental concerns could potentially influence the adoption of Agri-Environment-Climate Measures (AECMs) on family farms. However, the impact varies depending on employment status and work schedules, with gender differences in adoption behavior disappearing for part-time family farms.

Capacity Building

Capacity building is a multifaceted concept encompassing various dimensions of empowerment and development. It involves enhancing women's abilities, skills, and resources to participate fully in the social, economic, political, and cultural domains. According to (Eger et al., 2018), it involves understanding "the relational acts through which empowerment and education acquire their value and meaning." This approach emphasizes the interplay between social learning, relational agency, and culture in building women's capacities. This study proposes an interlinked system of community capacity and empowerment dimensions, highlighting that capacity building is not just about individual growth, but also about changing community perceptions and norms (Eger et al., 2018). Capacity building is closely tied to education and one's ability to aspire. (Eger et al., 2018) noted that in rural Berber villages, "the meaning of education equates to the capacity to aspire to a different life." This suggests that capacity building is not only about acquiring skills but also about expanding one's vision of what is possible. Furthermore, the process of capacity building can lead women to become role models within their communities, challenging traditional gender norms and perceptions (Eger et al., 2018).

Women's training programs for skill development in agriculture have gained significant attention worldwide, including India, as a means of empowering women and improving agricultural productivity. However, the effectiveness of these programs and their impact on women's empowerment vary across contexts. In India, several initiatives have aimed to enhance women's agricultural skills. The National Policy for Skill Development and Entrepreneurship (NPSDE) was designed to upskill Indian youth, including women, and foster entrepreneurship (Shaikh & Ganesh, 2024). However, the policy has faced challenges in effectively including marginalized groups, particularly women, owing to entrenched social barriers and gender biases. To address these issues, recommendations include adopting an entrepreneurial ecosystem approach, explicitly defining 'skill' and 'skilling' to align with socio-political realities, and designing training initiatives from an empowerment perspective (Shaikh & Ganesh, 2024). Women's participation in agriculture is increasing, this trend, known as the feminization of agriculture, does not necessarily lead to empowerment. In fact, it may be better described as the feminization of agrarian distress (Pattnaik et al., 2017). Women's growing contribution to agricultural labor often adds to their already heavy work burden, potentially undermining their well-being (Pattnaik et al., 2017). This contradiction highlights the need for training programs that not only develop skills, but also address broader social and economic issues affecting women in agriculture.

Women's awareness of health, nutrition, and sanitation is crucial for improving their overall well-being and reducing health risks. Several studies have highlighted the importance of education and awareness in this regard. Research indicates that many women, especially in developing countries, lack adequate knowledge about menstrual hygiene management (MHM) and its impact on health (Sahin et al., 2015; Santra, 2017). A study in Kolkata found that only 20% of

women had prior knowledge of menstruation before menarche, emphasizing the need for early education (Santra, 2017). Similarly, a study in Ethiopia revealed that only 60.9% of high school girls had a good knowledge of menstrual hygiene (Upashe et al., 2015). There are contradictions in the relationship between visual cleanliness and presence of pathogens. A study in maternity units in India and Bangladesh found no clear correlation between visually assessed cleanliness and the presence of pathogens, suggesting that visual assessment alone is inadequate for ensuring hygiene (Cross et al., 2016). Multilevel interventions are necessary to address these issues. These include promoting low-cost WASH interventions, improving cleaning services, closely monitoring cleaning activities, and introducing gender-sensitive WASH infrastructure (Kabir et al., 2021). Additionally, leveraging technology, such as mobile applications for food recognition and nutritional information, can help raise health awareness among non-health conscious individuals (Ogay et al., 2017). Ultimately, community-led strategies and local empowerment are crucial for establishing sustainable solutions for water, sanitation, and hygiene (WASH) services (Kumar et al., 2023).

Women's education and literacy improvement in India have shown progress but continue to face significant challenges. The overall literacy rate in India is 73%, with a notable gender disparity of 80.9% for men and 64.6% for women (Katiyar, 2016). This gap is even more pronounced in rural areas, where female literacy drops to 25% (Latif, 2009). The importance of women's education extends beyond that of individual empowerment. This has been linked to enhanced human capital in the next generation, contributing to economic growth (Behrman et al., 1999). Additionally, women's education has been associated with improved family health, child survival, and investment in children's human capital (Hill & King, 1995). However, contradictory findings suggest that in some areas with higher women's labor force participation, girls have relatively lower literacy than boys, possibly due to increased female labor force participation, which depresses their education (Sundaram & Vanneman, 2007). Efforts to improve women's education and literacy in India must address several factors. These include addressing gender biases in curricula and textbooks, cultural norms that hinder girls' education, and a lack of suitable employment opportunities for moderately educated women (Chatterjee et al., 2018; Latif, 2009). Furthermore, improving health literacy among pregnant women has been shown to enhance their empowerment, highlighting the interconnectedness of education and health outcomes (Tavananezhad et al., 2022). To achieve meaningful progress, India needs comprehensive nationwide, state-wide awareness programs that engage multiple stakeholders to improve overall literacy, with a particular focus on reducing the gender gap in education (Gupta et al., 2015).

Gender Equity

Gender equity is a multifaceted concept that focuses on ensuring equal opportunities and outcomes for both men and women in various aspects of life. It involves assessing how public policies impact gender equality and examining cooperative behaviors within households, workplaces, and broader socioeconomic, political, and institutional domains. Gender equity is a crucial component of sustainable development strategies, aimed at empowering both men and women, reducing poverty, and improving living standards (Abiodun & (Ph.D.), 2024). Gender equity in watershed management in India faces significant challenges, despite efforts to promote integrated watershed management in drought-prone areas (Shiferaw et al., 2008). While communities and the public bear the costs of groundwater recharging facilities, individual farmers capture irrigation benefits, leading to an inhomogeneous distribution of irrigation water (Shiferaw et al., 2008). This situation is exacerbated by power subsidies and negligible pumping costs, which displace water-efficient crops in favor of water-intensive crops in water-scarce areas (Shiferaw et al., 2008). The presence of gender-sensitive policies does not always reflect

gender equality across various indicators in South Asian countries, including India (Gill & Stewart, 2010). This contradiction highlights the complex relationship between gender-sensitive policies and women's empowerment, which requires an analysis of how policies align with the social, cultural, political, and economic factors related to women's health and well-being (Gill & Stewart, 2010). To address these challenges, potential policy options to enhance local collective action in water management have been evaluated using econometric models (Shiferaw et al., 2008). The results suggest that different types of water user charges can be introduced, with modest consequences on profitability and farm income. If properly implemented and managed by local communities, pro-poor policies can bring considerable sustainability benefits and ensure enhanced equity in access to water resources (Shiferaw et al., 2008). This approach aligns with the need for gender-sensitive disaster intervention programs and the focus on gender inequalities to achieve gender equity in the context of the Millennium Development Goals (Bhadra, 2017).

Watershed development projects in India have evolved to incorporate participatory approaches, aiming to build rural adaptive capacity and strengthen natural-resource-based livelihoods in semi-arid areas (Singh, 2017). However, the implementation of these projects often reinforces existing power structures and gender- and caste-based hierarchies, raising questions about who truly benefits from participatory watershed projects and to what degree (Singh, 2017). Community participation is emphasized in watershed development policies, the reality on the ground shows that without adequate empowerment, expectations of community participation augmenting rural livelihoods, and building adaptive capacity to climatic risks remains largely rhetorical (Singh, 2017). This contradiction highlights the need for a restructuring of watershed implementation that includes both hard and soft adaptation approaches, allowing for strategies that first empower and then engage communities in livelihood strengthening and resource stewardship (Singh, 2017). Although watershed development projects in India aim to be participatory and inclusive, the actual changes in gender roles and responsibilities appear to be limited. The reviewed studies do not provide specific information on how gender roles have changed as a result of these projects. Instead, they highlight the persistence of existing power structures and the need for more effective empowerment strategies to ensure equitable participation and benefits for all community members, including women (Bouma et al., 2007; Singh, 2017).

Watershed development initiatives have evolved from top-down approaches to participatory processes aimed at building rural adaptive capacity and addressing social issues. However, the efficacy of these initiatives in achieving their intended goals has been mixed, particularly in addressing discrimination and social norms (Singh, 2017). Studies have shown that community participation in watershed projects often reinforces existing power structures and gender- and caste-based hierarchies, raising questions about who truly benefits from these interventions (Singh, 2017). This aligns with research on social norms and prejudice, which demonstrates that the public expression of prejudice is highly correlated with social approval (Crandall et al., 2002). In watershed development contexts, this suggests that existing discriminatory norms may be perpetuated without targeted intervention. To address these challenges, watershed management strategies should incorporate both "hard" and "soft" adaptation approaches (Singh, 2017). This includes not only building physical infrastructure but also focusing on inclusive institution-building and incentivizing sustainable resource use. Additionally, integrating insights from social-cognitive development research could help in understanding how children develop prejudices and intervene effectively (Rutland et al., 2010). Ultimately, successful watershed development initiatives should aim to empower communities, challenge existing discriminatory norms, and promote equitable resource stewardship (Kolinjivadi et al., 2014; Singh, 2017).

CHALLENGES AND LIMITATIONS

Watershed development projects often face challenges in ensuring women's participation because of various barriers. These barriers stem from existing social structures, cultural norms, and institutional limitations (Rahman et al., 2023; Singh, 2017). One of the primary challenges is the reinforcement of the existing power dynamics and gender-based hierarchies in participatory watershed projects. This often results in unequal benefit distribution and limited involvement of women in decision-making processes (Singh, 2017). The persistence of cultural expectations and traditional gender roles also poses significant obstacles to women's active participation in watershed management (Quang et al., 2023). In many cases, watershed interventions focus primarily on hard adaptation options, such as infrastructure development, without adequately addressing soft adaptation approaches, such as building inclusive institutions or incentivizing sustainable resource use (Singh, 2017). This imbalance can limit women's opportunities for meaningful engagement in at project. Institutional barriers, including hierarchical confusion, discrepancies among regulations, and weak coordination among stakeholders, further hinder women's participation in watershed management (Narendra et al., 2021). Additionally, the lack of community participation in the planning stage and limited readiness to integrate watershed planning into regional planning exacerbate these challenges (Narendra et al., 2021). The influence of the capitalist patriarchy on agricultural practices has led to a decline in women's participation in the agricultural sector, which is closely linked to watershed management (Rahman et al., 2023). Neoliberal policies, such as the mechanization of agriculture and commercial land use, have further marginalized women's roles in these areas (Rahman et al., 2023). To address these challenges, it is crucial to implement gender-transformative approaches that address power asymmetries and build capacity among marginalized groups (Mutimukuru-Maravanyika et al., 2016). This may involve providing adequate information, appropriate species choices, and effective soil and water conservation techniques (Narendra et al., 2021). Additionally, strengthening public awareness of sustainable watershed management and providing access to community involvement at each stage could help overcome these barriers. Overcoming barriers to women's participation in watershed development requires a multifaceted approach that addresses the social, cultural, and institutional challenges. By implementing gender-sensitive policies, promoting inclusive decision-making processes, and balancing hard and soft adaptation approaches, watershed projects can engage women and harness their valuable knowledge and contributions to sustainable resource management.

Participatory watershed management approaches, which often involve SHGs, may not always effectively address the needs, constraints, and practices of the local people (Johnson, 2002). This suggests that SHGs may face challenges in accurately representing and addressing the diverse needs of all community members. Community participation in watershed projects, including SHGs, can sometimes reinforce existing power structures and gender- and caste-based hierarchies (Singh, 2017). This implies that SHGs may not always be inclusive or equitable in their representation and decision-making process. The effectiveness of participatory approaches, including SHGs, in building local adaptive capacity has not always matched intentions, leaving farmers exposed to unpredictable water supplies (Singh, 2017). This indicates that SHGs may be limited in achieving long-term sustainability and resilience in watershed management. Although SHGs are intended to promote community participation and local empowerment in watershed development, they may face challenges related to inclusivity, equitable representation, and long-term effectiveness. To address these limitations, watershed management programs should focus on both hard and soft adaptation approaches, emphasizing the empowerment of communities and the development of inclusive institutions (Singh, 2017).

The Scalability of successful watershed development models faces several challenges and limitations, primarily owing to the complex nature of watershed management and the diverse factors involved. One of the main challenges is the integration of multiple stakeholders and their needs during the decision-making process. Participatory watershed management, which involves users defining problems, setting priorities, and selecting technologies, is expected to improve performance but raises new questions about organizing stakeholders and facilitating collective action (Johnson, 2002). The institutional aspect of watershed management often suffers from hierarchical confusion, discrepancies among regulations, and weak participation, synchronization, and coordination among stakeholders (Narendra et al., 2021). The disproportionate emphasis on organizational development, compared to watershed planning efforts, can play a significant role in the day-to-day operations of watershed groups. This focus on organizational aspects can sometimes overshadow the actual environmental issues at hand (Bonnell & Koontz, 2007). Additionally, the complexity of watershed systems requires the consideration of multiple stressors and fine-scale ecosystem processes, which can be challenging to incorporate into existing models (Sun et al., 2023). The successful scaling of watershed development models requires addressing both technical and social aspects. This includes integrating advanced modeling tools with decision support systems that can forecast the short and long-term consequences of management decisions under environmental change (Sun et al., 2023). Furthermore, bridging data gaps through remote sensing and hydrological-based simulation models, simplifying assessment criteria, and strengthening public awareness and participation are crucial for overcoming the scalability challenges in watershed management (Hubbart et al., 2019; Narendra et al., 2021).

EVALUATION METHODOLOGIES FOR WOMEN'S EMPOWERMENT IN WATERSHED DEVELOPMENT

Evaluation methodologies for women's empowerment in watershed development require a comprehensive approach that combines both quantitative and qualitative tools. Mixed methods are recommended to assess economic empowerment comprehensively (Pereznieto & Taylor, 2014). This approach allowed us to capture both the measurable outcomes and nuanced experiences of women in watershed contexts. Quantitative tools often include indices and scales for measuring empowerment. The Women's Empowerment in Agriculture Index (WEAI) and its project-level adaptation (pro-WEAI) are widely used to measuring empowerment across the domains of intrinsic agency, instrumental agency, and collective agency (Malapit et al., 2019). These tools can be adapted to watershed contexts to assess women's participation and decision-making power in water resource management. Qualitative methods are crucial to understanding the contextual factors that influence women's empowerment. In-depth interviews, focus group discussions, and participatory approaches can provide rich insights into women's experiences, challenges, and perceptions of empowerment in watershed development projects (Lindacher et al., 2017; Maguirre et al., 2016). These methods are particularly valuable for capturing the nuances of empowerment in indigenous communities and culturally diverse settings. Some studies have found no positive linear relationship between education and various facets of women's empowerment, highlighting the complex interplay of gender ideologies and socio-economic constraints (Jayaweera, 1997). This underscores the importance of using context-specific evaluation tools to capture such nuances.

Gender equality indicators in watershed development programs require a multifaceted approach that considers both the quantitative and qualitative aspects. The integration of hydrological and biological indicators can provide insights into the spatial and temporal distributions of conditions resulting from land use changes, which may have gendered impacts (He et al., 2000). However, these indicators alone are insufficient to measure gender

equality. To effectively measure gender equality in watershed development programs, it is crucial to incorporate indicators reflecting women's empowerment and agency. The Women's Empowerment in Agriculture Index (WEAI) and its project-level adaptation (pro-WEAI) offer valuable frameworks for this purpose (Malapit et al., 2019). These tools map indicators into three domains: intrinsic agency (power within), instrumental agency (power to), and collective agency (power within), providing a comprehensive view of women's empowerment in agricultural contexts. An effective approach for measuring gender equality in watershed development programs should combine ecological indicators with gender specific metrics. This could include assessing women's participation in decision-making processes, access to resources, and economic opportunities in the watershed context. Incorporating qualitative indicators that capture human rights, equity, and capabilities (Onditi & Odera, 2016) would provide a more holistic understanding of gender equality outcomes in watershed development initiatives.

Participatory evaluation approaches have been widely used to assess and promote women's empowerment in various contexts. These methods aim to involve women directly in the evaluation process, thereby fostering their active participation and agency. Studies have shown that participatory approaches can lead to social, technological, political, and psychological empowerment of women (Lennie, 2005). For instance, the LEARNERS process, which utilizes participatory action research and evaluation methods, has demonstrated effectiveness in empowering rural Australian communities, particularly women (Lennie, 2005). While participatory approaches are generally considered positive, they can sometimes have contradictory effects. Some studies have identified the corresponding disempowering impacts alongside empowering impacts (Lennie, 2005). Additionally, in certain contexts, such as rural Morocco, despite the implementation of participatory approaches, women's involvement in decision-making processes remains limited, with their roles often restricted to providing cheap or free manual labor (Montanari & Bergh, 2019). Participatory evaluation approaches for women's empowerment show promise but require careful implementation. Successful models, such as the five-step participatory action research model developed in Pakistan for women's empowerment, demonstrate the potential of these approaches (Aziz et al., 2011). However, it is crucial to recognize that non-participation and peripheral participation can also be valid choices for community members and may be individually empowering (Hayward et al., 2004). To effectively assess women's empowerment, a mixed-methods approach combining quantitative and qualitative methods is recommended, along with the use of standardized measures such as the Women's Empowerment in Agriculture Index (WEAI) (Pereznieto & Taylor, 2014; Quisumbing et al., 2023).

CASE STUDIES

The Sister Watersheds project, involving Brazilian and Canadian partners from 2002-2008, focused on expanding grassroots participation, especially that of women, in watershed governance processes (Figueiredo & Perkins, 2012). This project, along with another project in Africa from 2010-2012, aimed to develop models for community-based environmental and climate change education that leveraged watershed-based governance structures to broaden women's involvement in political processes related to water management. There is growing recognition of the need for women's leadership in watershed initiatives, their successful implementation remains a challenge. The Sister Watersheds project offers a promising model, but more widespread and sustained efforts are required to empower women in watershed management. Future initiatives should focus on addressing the structural barriers to women's participation and ensuring their meaningful involvement in decision-making processes.

Community-based watershed management (CBWM) has been recognized as an effective approach for managing watersheds, particularly in developing countries (Ikhlas & Ramadan, 2023). This approach emphasizes the importance of community participation in watershed management activities. The success of CBWM is influenced by socioeconomic, institutional, and technical factors, that should be considered when implementing such programs in a region. Agidew & Singh, 2018 investigated the factors affecting farmers' participation in watershed management programs in Ethiopia. The study found that farmers' perceptions, government support, land redistribution, gender, agricultural labor force, extension services, farm size, and slope of farmland were significant factors influencing participation. This suggests that SHG models should consider these factors in order to enhance community involvement. Mullen & Allison, 1999 examined different watershed management models in Alabama, categorizing them into four types based on the level of stakeholder involvement and social capital. The study found that both the short-term project success and long-term sustainability of watershed management activities depend heavily on the amount of social capital in the watershed.

FUTURE DIRECTIONS

SHGs has shown positive impacts on women's economic and political empowerment, mobility, and control over family planning (Brody et al., 2016). However, there is a need for further research on the specific activities and models of SHGs that are most effective in promoting empowerment. Future studies should focus on evaluating different SHG models and their impact on various dimensions of empowerment (Brody et al., 2016; Gugerty et al., 2018). SHGs have been successful in improving women's economic status, there is growing recognition that addressing deep-seated gender norms requires involving men in the process (Kumar et al., 2021). Future interventions should explore ways to engage men in SHG programs to promote more comprehensive changes in gender dynamics and attitudes towards women's empowerment. There is an increasing emphasis on measuring outcomes and quantifying progress towards gender and developmental goals (Mckinnon et al., 2016). Future research should focus on developing more nuanced, place-based approaches to understand and measure gender equality and economic empowerment, taking into account diverse economic practices and forms of non-cash exchange and unpaid labor (Mckinnon et al., 2016). The role of SHGs in promoting women's entrepreneurship and micro-enterprises is an emerging area of interest (Alrefaei et al., 2022; Paramanandam & Packirisamy, 2015). Future studies should explore how SHGs can better support women in establishing and sustaining their own businesses, including providing technical knowledge, skill training, and marketing techniques (Arul Paramanandam & Packirisamy, 2015). There is growing recognition of the need for a human rights-based approach to women's empowerment, addressing multiple dimensions such as sexual, reproductive, economic, political, and legal rights (Sen & Mukherjee, 2014). Future SHG interventions should incorporate a more comprehensive rights-based framework to promote holistic empowerment.

SHGs should focus on developing micro-enterprises and entrepreneurship among female members, as this has been shown to have a causal relationship with empowerment (Chatterjee et al., 2018). Policymakers should support SHGs by providing technical knowledge, skill training, and marketing techniques to women to establish sustainable enterprises (Arul Paramanandam & Packirisamy, 2015). This approach can lead to economic independence, job creation, enhanced income, and strengthened purchasing power in rural areas. SHG participation has a positive impact on community-level empowerment, it may lead to more conflictive relationships between spouses at the household level (Alemu et al., 2018). This suggests that policies should also address gender norms and involve men in the empowerment process to mitigate the potential backlash effects. Additionally, SHGs alone may be insufficient

to change deep-seated gender norms that disempower women (Kumar et al., 2021), indicating the need for complementary interventions.

Policymakers should adopt a multi-faceted approach to women's empowerment through SHGs in watershed development. This includes promoting micro-entrepreneurship, providing skills training, addressing gender norms, and involving men in the process. Furthermore, integrating SHGs with health and nutrition interventions can lead to more effective outcomes and contribute to achieving the Sustainable Development Goals (Pradhan et al., 2023). Continuous policy commitment to equality for its own sake may be necessary to bring about a lasting change in gender relationships.

CONCLUSION

This study has shed light on the complex relationship between Self-Help Groups (SHGs) and women's empowerment within the context of watershed development programs in India. The findings reveal a nuanced picture of progress and persistent challenges in achieving gender equality and women's empowerment through these initiatives. The research demonstrates that SHGs have made significant contributions to women's empowerment across multiple dimensions. Economically, they have facilitated increased participation in income-generating activities and improved financial inclusion. Socially, they have enhanced women's decision-making power and social mobility. Politically, they have encouraged greater involvement in local governance structures. Environmentally, they have promoted women's participation in natural resource management and sustainable practices.

However, the study also highlights several limitations and areas for improvement. Persistent gender inequalities, limited access to resources, and the reinforcement of existing power structures continue to hinder the full realization of women's empowerment through SHGs. These challenges underscore the need for more comprehensive and targeted approaches to address deep-rooted gender norms and ensure equitable participation in watershed management. The mixed-methods approach employed in this research has provided a holistic understanding of the impacts of SHGs on women's empowerment, combining quantitative indicators with qualitative assessments. This methodology has allowed for a more nuanced evaluation of the effectiveness of SHGs in promoting women's empowerment within the context of watershed development programs.

Moving forward, several key recommendations emerge from this study:

1. Develop and implement gender-sensitive policies that specifically address the barriers to women's full participation and empowerment in watershed management.
2. Integrate both hard and soft adaptation approaches in watershed projects, recognizing the importance of technical interventions alongside social and behavioral change strategies.
3. Promote women's leadership in environmental decision-making processes, ensuring their voices are heard and their perspectives are incorporated into project planning and implementation.
4. Strengthen the capacity of SHGs to address intersectional inequalities, recognizing that women's experiences of empowerment may vary based on factors such as caste, class, and education level.
5. Foster partnerships between SHGs, government agencies, and non-governmental organizations to create a more supportive ecosystem for women's empowerment initiatives.

SHGs have demonstrated their potential as catalysts for women's empowerment in watershed development programs, there is a need for continued research, policy innovation, and practical interventions to fully harness their transformative potential. By addressing the identified challenges and building on the successes, SHGs can play an even more significant role in advancing gender equality and sustainable development in rural India.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1. ChatGPT 3.5 used to overcome the grammatical error in the manuscript.

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