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COMMUNITY BANK INVESTMENTS IN RENEWABLE ENERGY PROJECTS: AN ANALYSIS OF TRENDS, MOTIVATIONS, AND OUTCOMES IN THE USA

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This study examines the evolving role of USA community banks in financing renewable energy (RE) projects, investigating how these institutions have adapted their traditional lending practices to support clean energy initiatives. The research aims to analyze the integration of Environmental, Social, and Governance (ESG) factors into community bank lending decisions, identify key drivers and barriers influencing their participation in renewable energy financing, and assess the broader socioeconomic and environmental impacts of their involvement in the clean energy transition. The study employs a mixed-methods approach combining document analysis of policy frameworks and financial data, industry trend analysis, and examination of community bank lending portfolios. The research methodology includes analysis of regulatory changes, policy incentives, and their impact on community bank lending behaviors, alongside assessment of financing patterns across different renewable energy project types and geographic regions. Data sources encompass federal banking regulations, industry reports, community bank financial statements, and renewable energy project financing records. The research reveals that community banks have increasingly integrated ESG considerations into their lending practices, driven by factors including community relations enhancement, brand reputation building, regulatory compliance, and policy incentives. Community banks demonstrate significant advantages in renewable energy project financing, particularly in rural areas, due to their strong local relationships, understanding of regional market conditions, and ability to provide flexible financing solutions during relevant project development phases. However, the study identifies persistent challenges, including limited technical expertise in evaluating renewable energy projects, complex regulatory frameworks, and inadequate risk assessment tools. The analysis confirms substantial environmental benefits from community bank-financed renewable energy projects, including measurable carbon emission reductions, enhanced local energy security, job creation, and strengthened community resilience. Notwithstanding these positive outcomes, the research highlights the need for improved technical capacity building and more sophisticated risk management frameworks. In conclusion, Community banks play a significant role in advancing clean energy goals across the United States, particularly in underserved rural markets where traditional financial institutions have limited presence.

KEYWORDS: ***Community Banks, Renewable Energy Financing, Sustainable Development, Environmental and Social Impact.***

1.0 INTRODUCTION

The deployment of renewable energy (RE) resources can provide great benefits in alleviating the impacts of climate change, whilst addressing the ever-growing energy demands of the world effectively. Nonetheless, the capital expenditure requirements for new RE projects are often exceedingly high and, in some cases, exceed the costs associated with conventional energy projects (Miller et al., 2018). The capital costs for renewable energy sources (RES) can reach up to 200% of the costs associated with fossil fuels (Administration, 2013). This is, in part, due to overwhelming project budget deficits, as many developers of renewable energy systems have comparatively lower revenues due to the higher payback period. In other words, resorting to financing of project costs is, in fact, unavoidable. Securitization of such funding is a necessary step for the broader incorporation of renewable energy sources into the energy strategies of nations

and regional subsectors (Ekpei & Agbeve, 2025). In principle, there are numerous options available to finance renewable energy (RE) projects, but early-stage projects, especially those incorporating novel technologies or located in areas with ambiguous resources, are at a greater risk of having funding issues, as depicted in figure one (Papaefthymiou & Dragoon, 2016; Taghizadeh-hesary & Yoshino, 2020).

Broadly, as the projects progress from innovation to technical validation and ultimately to commercial maturity, they become available to a wider array of investors, with potential public or private exit opportunities (Jagwe et al., 2024; Latupeirissa et al., 2024). Considering the value such projects offer the environment, government funding is almost always significant, especially when channeled directly via subsidies or indirectly through supportive regulations and policy frameworks (Egli et al., 2018; Lu et al., 2020; Sachs et al., 2019).

Over the past three decades, an extensive number of life cycle assessments (LCAs) have been performed on various residential and utility-scale photovoltaic (PV) systems. However, these studies have been useful; they have produced differing results because of the variety in technology used, the assumptions made, and the methodology employed. The National Renewable Energy Laboratory (NREL) coordinated the LCA Harmonization Project, which aimed at minimizing variation and achieving more consistent estimates of lifecycle greenhouse gas (GHG) emissions associated with PV systems using a uniform approach (NREL, 2012; Adebayo et al. 2025).

At the same time, the financial environment surrounding RE has changed, with US community banks stepping up to participate in green financing in the past ten years. These banks, which focus on a specific region and have strong community relations, are now starting to finance renewable energy as part of a broader shift in the economy toward supporting environmental sustainability and ESG investments (Hanauer et al., 2021). Unlike large national banks, community banks have better market access to unelectrified rural regions for small- and medium-scale clean energy projects, where local understanding and community relations are particularly important. Still, they face barriers such as a lack of knowledge in energy markets and complex regulations (Cameron & van Tilburg, 2016; Robinson et al., 2025; Stuebi et al., 2020). Without these barriers, some policymakers can pursue socially responsible financing strategies that advance community initiatives. This work examines the link between financing renewable energy projects and community banking in America. It attempts to broaden the perception of the role community banks might have in accelerating clean energy adoption at the national level by investigating the investment patterns, drivers, and results.

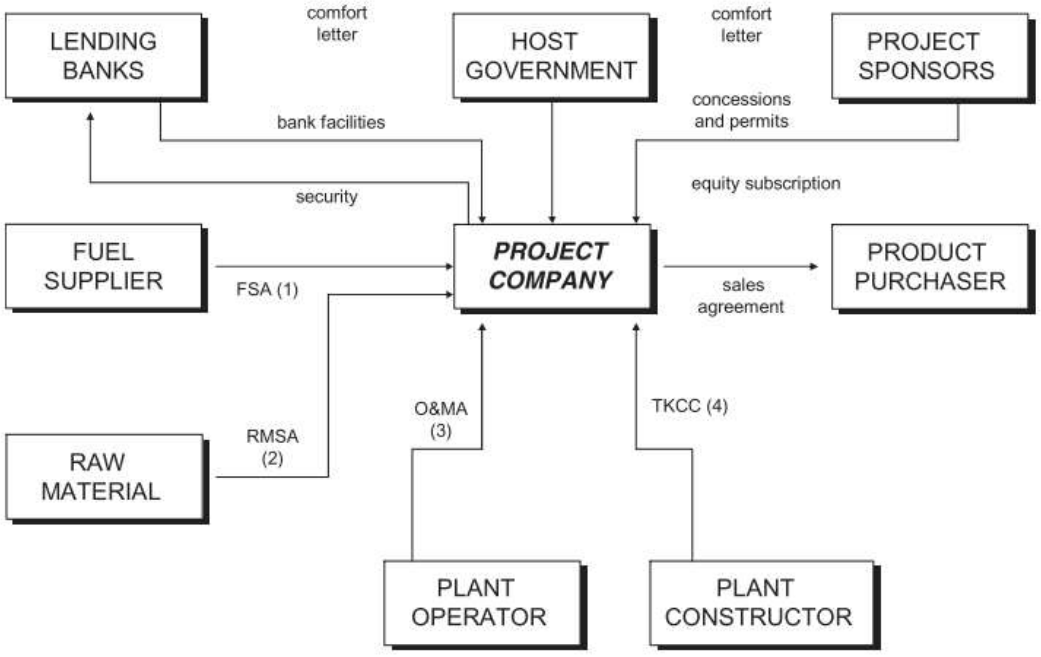


Fig. 1: Typical Project Finance Deal Contract Structure [(1) Agreement for the Supply of Fuel; (2) Agreement for the Supply of Raw Materials; (3) Agreement for the Operation and Maintenance; (4) Turnkey Construction Contract] (Adolph, 2016).

2. TRENDS IN COMMUNITY BANK INVESTMENTS IN RENEWABLE ENERGY

Renewable energy sources can widen the gap between energy supply and demand while simultaneously mitigating environmental impacts (Xu et al., 2019). As stated by the International Renewable Energy Agency, 66% of energy consumption in the world needs to come from renewables by the year 2050 (Tian, 2021; Xu et al, 2019). Shi et al (2016) & Shi et

al (2018) highlight that in the previous years, there has been a significant interest in the development of renewable energy resources. It has been shown that there is an internationally accepted consensus to support the development and utilization of renewable energies, which is now seen to be the center of multilateral cooperation. As Tatti et al (2023) state, the energy industry is amid the shift of transformation. Turning back the clock, the energy industry has been a longstanding pillar in the development of contemporary civilizations.

The economy runs, and daily activities such as commuting rely heavily on energy. However, the way energy is consumed and generated has a significant impact on global warming and climate change. Burning fossil fuels is a major contributor to global warming. Many countries are working to reduce their greenhouse gas emissions, driven by the increasing demand to transition towards more sustainable energy sources (Energy, 2012; Milkoreit, 2019). It is vital to acknowledge the efforts to counter the PA on climate change, which, in 2015, after a decade of tedious negotiations and a failed attempt in Copenhagen in 2009, ushered in global governance for climate. The PA was established (Milkoreit, 2019). The PA evolved from legally binding emission reduction commitments for some parties to a pledge-and-review system, which had no mandatory mitigation obligations for any party. Following the election of Donald J. Trump in 2016, the US experienced a significant shift in its leadership role on climate (Urpelainen & Van de Graaf, 2018). This shift was indicated during his campaign and, upon assuming office, most notably through an executive order that canceled his predecessor's emission reduction policies (House, 2014; Urpelainer, 2009). The announcement of America's exit from the Paris Agreement was made on June 1, 2017, and it would officially take 4 years to actualize due to the terms of the treaty (Milkoreit, 2019).

2.1 Overview of Community Banks in the U.S. Financial Landscape

The effectiveness of forecasting the fate of community banks is vague because of the ongoing consolidation in the banking industry (Hanauer et al. 2021). Furthermore, there is a worrying trend of a steady decline in community banks in America over the last few decades. On the other hand, the share of community banks in the assets of the U.S. banking systems has sharply declined due to the accumulating development and extensive branch networks of the nation's giants. Alongside the competition from big banking institutions, changing population dynamics, new advances in financial technology, and deeper economic consolidation pose serious threats to the survival of community banks (Agbeve et al. 2025). Regardless of the depreciation of their market share, community banks persist as a major source of credit and other financial services in America. Adams and Gramlich, 2014, Hanauer et al., 2021. Community banks serve as a fundamental source of financial services in rural parts of the country and are vital for the local economy.

The role of small banks during the Global Financial Crisis and their distribution of relief funds during the COVID-19 pandemic is evidence enough that community banks are large providers of credit (Appiah et al. 2025). Even during periods of economic strain, community banks provide significant support to agricultural and commercial borrowers (Hanauer et al., 2021). The US banking industry's structural mutation is rather staggering. The number of commercial banks was 14,376 in 1984; by 2020, it had dropped to 4,404 (Agbeve et al. 2025). That's a roughly 70% decrease! The number of commercial banks also experienced an almost 50% decline during the years 2000 to 2020. Agbeve et al. (2025) noted that there was a reduction in the number of community banks, too, from about 8,300 to 4,277 (Table 1). By June of 2020, the US had 127 non-community banks alongside 4,277 community banks. Moreover, while the number of banks has declined, the concentration of banking assets in the largest banking organizations has grown (Barboni & Rossi, 2019; Hanauer et al., 2021).

Table 1: Share of Community Banks and Noncommunity Banks in Total U.S. Banking Activity (Hanauer et al., 2021)

Category / Characteristic	Community Bank Share			Noncommunity Bank Share		
	2000	2010	2020	2000	2010	2020
Banks						
Number of banks	8,315	6,530	4,277	99	94	127
Percent of total banks	98.8%	98.6%	97.1%	1.2%	1.4%	2.9%
Assets						
Amount (in trillions)	$2.391	$2.475	$2.656	$6.051	$11.236	$17.015
Percent of total assets	28.3%	18.1%	13.5%	71.7%	81.9%	86.5%
Deposits						
Amount (in trillions)	$1.848	$1.996	$2.194	$3.762	$7.468	$13.580
Percent of total deposits	32.9%	21.1%	13.9%	67.1%	78.9%	86.1%
Loans						
Amount (in trillions)	$1.517	$1.629	$1.817	$3.700	$5.959	$8.401
Percent of total loans	29.1%	21.5%	17.8%	70.9%	78.5%	82.2%
Total Offices						
Number of offices	39,011	39,435	31,352	32,119	48,228	47,974

Percent of total offices	54.8%	45.0%	39.5%	45.2%	55.0%	60.5%
Rural Offices						
Number of rural offices	14,158	14,164	12,062	3,549	4,825	4,728
Percent of rural offices	80.0%	74.6%	71.8%	20.0%	25.4%	28.2%
Percent of rural deposits	75.4%	71.9%	65.9%	24.6%	28.1%	34.1%
Urban Offices						
Number of urban offices	24,853	25,271	19,290	28,570	43,403	43,246
Percent of urban offices	46.5%	36.8%	30.8%	53.5%	63.2%	69.2%
Percent of urban deposits	33.3%	20.4%	11.6%	66.7%	79.6%	88.4%

Community banks still make up a sizable portion of all banks, but their percentage of total banking activity is much less and is on the decline (Agbeve et al. 2025). The proportion of assets, deposits, and branches held by community banks has significantly decreased since 2000. Though they only make up 40% of bank branches, 14% of deposits, 18% of loans, and a little more than 13% of assets, community banks currently account for 97% of all bank charters (Beck et al., 2018; Hirtle, 2007). Table 2 illustrates how consolidation has also altered community banks. The percentage of community banks with assets under $100 million has decreased to about 21% from nearly half in 2000. Community banks make up 35 percent of all community bank branches and 40 percent of community bank assets, despite just 12 percent of them having assets between $1 billion and $5 billion (Hanauer et al., 2021).

Table 2: Distribution of Community Banks by Size of Organization (Hanauer et al., 2021)

Size Group	Number of Banks (2000)	% of All Community Banks (2000)	Number of Branches (2000)	% of All Branches (2000)	Assets ($B, 2000)	% of All Assets (2000)	Number of Banks (2021)	% of All Community Banks (2021)	Number of Branches (2021)	% of All Branches (2021)	Assets ($B, 2021)	% of All Assets (2021)
< $100 million	3,950	47.5%	6,659	17.1%	$210	8.8%	886	20.7%	1,491	4.8%	$53	2.0%
$100M – $500M	3,528	42.4%	15,383	39.4%	$754	31.5%	2,171	50.8%	9,051	28.9%	$532	20.0%
$500M – $1B	450	5.4%	4,848	12.4%	$316	13.2%	605	14.1%	5,203	16.6%	$419	15.8%
$1B – $5B	325	3.9%	8,369	21.5%	$661	27.7%	532	12.4%	10,973	35.0%	$1,061	39.9%
$5B – $10B	62	0.7%	3,752	9.6%	$450	18.8%	83	1.9%	4,634	14.8%	$591	22.3%
All Community Banks	8,315	100.0%	39,011	100.0%	$2,391	100.0%	4,277	100.0%	31,352	100.0%	$2,656	100.0 %

2.2 Growth of Renewable Energy Financing

According to Lam and Law (2018), project financing for renewable energy is determined by the availability of the resource, level of technology, economic feasibility, government policies, and the regulatory framework. For example, hydroelectric projects require pre-investment financing to deal with land acquisition and community impact issues (Hussain, 2013), and biomass projects are more reliant on carbon financing due to the risks related to resource availability and costs (Hussain, 2013). Solar fiscal requirements are in the form of large investment grants and tax expenditure subsidies to assist with the initial cost of the project, but borrowers are not relied on as much (Kalamova et al., 2011). Wind farms tend to heavily depend on loans because they are cheaper than making equity payments (dividends) (Karcher & Harbor, 2007). Generally, renewable energy (RE) projects are financed by a combination of debt, equity capital, and grant funding or subsidized aid. Debt may be in the form of a commercial bank loan or bonds, which are extensively used for the financing of expenditures during the start-up phase as well as the continuing phase. Concessional finance means a loan given by a government or development bank on very generous terms, usually at below market interest rates and low interest or with a long repayment period. Donastorg et al. (2017), Jachnik et al. (2015), and Pearson (2015) all apply credit instruments such as loan guarantees and credit enhancements to increase the creditworthiness of projects. These credits help to lower costs when framed within a blend of concessional and commercial loans provided through credit lines from development finance institutions (DFIs).

Green bonds have become an economically favorable instrument for financing RE as they are issued by governments, corporations, or multilateral agencies and are tied to the environment. An example of this would be the Climate Awareness Bonds that the European Investment Bank issued, and loan guarantees for global RE projects given by the Japan Bank for International Cooperation. The equity financing from venture capital or private equity firms depends on the project's stage and risk, which makes it more flexible. As stated by Olmos et al. (2012), government grants and subsidies reduce capital costs for marginal projects, which aids in providing support for such projects. Large-scale renewable energy projects tend to use project finance structures,

while corporate finance is preferred for smaller projects. Among other things, the increasing influence of technology companies in renewable energy purchasing and the advancements in energy storage technologies tend to change the financing models for the sector (Agbeve, 2025). Nevertheless, Schwerhoff & Sy (2017) claim that wind and solar energy infrastructure remains more expensive than fossil fuel-sourced energy.

Exploring the energy production site, big-scale generators, and coal reserves is still highly beneficial for a solar and wind market that has no limits. Each renewable source spends capital differently, along with using significantly more expensive materials for solar and wind energy as opposed to hydro energy. Despite this fuel dependence, the rest becomes internal. From the basic outlay enabling further exploration and expansion of structures, 665 billion was spent only for the first out of the whole multitude on needed advanced systems for energy. Efficiency needs colossal funds along with further phase constructions for venture capital, interests in renewable energy are racing to order legs and sockets for energy creations. In all branches of the economy, for 2015 alone, 10% was standalone for GDP choices. Reality shows alongside goal fillers for 40% hoping to obtain at least 60% through sponsoring private and communal construction, retails for renewables Adukpo & Mensah, 2025). Scarce of money, still with a boost from the government, defined infra focused on oil, relatively dense with earnings, it enables a shift towards renewables, alongside private contractors, making it was not achievable (Amoako et al. 2025). With still barely shifting to shallow dependence, effective outlines around weakening systems are providing significant aid to encourage wind and solar spending alongside sponsorship. Innovation in the ratio of spending versus profit becomes gradually more predictable in reaction to high-priced available fossil fuels accessible breaks filling by wins available but in the future are encased along with bordered subsidized price range disturbances. The global share of renewable energy resources remained low, even as some countries struggled with expanding modern renewable energy (Dept., 2019; Lagarde & Gaspar, 2019). National public funding has increased, but policies remain weak in having any substantial impact on a global level. Moreover, CO2 taxes are often low and vary from one country to another. Thus, without considerable efforts from the market, collaborative actions, and stronger, persistent frameworks, there will be no impactful progress in renewable energy (Krozer, 2019a, 2019b; Kubli, 2014).

2.3 Regional and Sectoral Investment Patterns

To confirm the approach devised by Tsepelev & Serikov (2016) on assessing the investment potential of different institutional sectors such as non-financial and financial corporations, households, and public administration, they advocated for an investment analysis model with a comprehensive regional economic architecture integrating sytems and sector dialectics as a more accurate determination of the investment appeal for the region. Similarly, as in other parts of the world, the US is also progressing through an energy transition. In some areas, renewable energy sources such as solar and wind are competitive with fossil fuels, and there is increasing interest in natural gas (Okonkwo et al. 2024). In 2017, the United States added 7 GW of new wind capacity, which ranked second in the world for new installations of wind energy capacity. At the end of last year, the world's wind power generation reached 89 GW or 3% of global electricity supply, ranking second after China (Faturay et al., 2020). Moreover, a single-region national input-output (I-O) model analyzing the economic impact of new wind energy infrastructure investments in Croatia indicated positive indirect and induced effects in the construction and manufacturing industries at the deployment stage of wind power plants in Croatia (Bertoni et al., n.d.; Mikulić et al., 2018). Caliendo et al. (2014) argue that the United States economy is subject to numerous acute or area-specific shocks, including technological change, regulatory shifts, or even catastrophes (Narteh-Kofi et al. 2025; Boateng et al. 2025). These disaggregated changes, whether regional or sectoral, affect the national outcomes through intricate relationships like labor migration, regional trade, and intersectoral input-output relations. Models were suggested that estimate the impact of basic productivity changes in defined areas or industries on productivity, output, and welfare by incorporating the sectoral and geographical distribution of the U.S. economy. For instance, experts draw attention to how industry is not evenly distributed throughout different regions and how important trade costs are because commodities and services often travel long distances. The effects of regional shocks on the country are the result of a combination of movable factors, such as labor and geographical constraints like the land and infrastructure. For example, the Louisiana economy, as well as some bordering regions, experienced a strained resource economy after sudden extensive outmigration post-Hurricane Katrina (Duranton et al., 2013; Narteh-Kofi et al., 2025). Their analysis, which showed that New York productivity growth has a much greater effect on the country than a similar shock in Florida, highlights that there is regional variation in aggregate GDP responses (Hope et al. 2025). In addition, if one ignores the regional trade flows, there is a strong underestimation of the impact on national productivity. All in all, their findings underscore the importance of the sectoral and spatial stratification of the economy's impacts and outcomes (Caliendo et al., 2014).

3. ENVIRONMENTAL AND SOCIAL OUTCOMES

Community banks in the U.S. are now considering investing in renewable energy due to its socioeconomic impacts and financial advantages. Such banks facilitate the transition to cleaner energy by investing in community solar power, wind energy, and energy efficiency projects. From an environmental perspective, the reduction of greenhouse gas emissions, improved air quality, and the transition to renewable energy sources all help mitigate climate change, as properly noted by Stoner and Kadeli in their 2012 work and Walters in 2021 (Walters et al., 2021). Socially, these projects also help create new jobs, lower energy costs for families, and increase energy self-sufficiency in remote rural areas or economically distressed regions (Timothy et al., 2016). While community banks aim to satisfy customer demand, which enables them to expand their loan portfolios, they, in turn, accrue reputational advantages aligned with ESG policies (Abramova,

2024; Saviano et al., 2024). In other words, community banks are responding to policy incentives that open new avenues for lending, such as using the USDA's REAP program, which subsidizes reserves relative to competing clean energy financing barriers for farms and small businesses, thus resulting in significant economic and environmental benefits. Moreover, the attention and financial expertise that community banks have gained regarding their local markets makes it possible for them to form deep-rooted relationships with their customers on an emotional level that could be exploited by national sellers. However, there remains a problem of a lack of modern technology, high perceived risk, and excessively simplistic regulations. Even so, the outcome has been improved access to energy, enhanced community resilience, and increased environmental stewardship. This underlines why policies with risk-sharing and the strengthening of capabilities to increase impact are so essential. In particular, the community bank investments in renewable energy demonstrate how community financial institutions can lead sustainable development, environmental justice, and green capitalism in the US (Borodako, 2023; Moore et al., 2022; Way, 2025).

CONCLUSION

The additional involvement of community banks in the financing of renewable energy sources is a promising addition to the other efforts made to decarbonize America's energy system. These economically supportive community institutions have, in the past, tried to invest in clean energy projects that aim at achieving both environmental and community development objectives aligned with supporting local economies. This study has shown that community banks, with their comparatively smaller asset sizes and localized operations, are best positioned to finance small- and medium-scale renewable energy projects in underserved regions. Their understanding of local concerns allows them to provide more adequate financing geared towards capital accessibility for businesses and individuals seeking to implement sustainable energy projects. The environmental impacts, such as increased air quality and reduced greenhouse gas emissions, will also include job opportunities, lower energy costs, and stronger economic resilience at the community level, thereby also having social impacts. However, the reliance on limited internal capacity for the sector is a stark reality, along with knowledge gaps related to needed technical skills, and a complex network of regulations. Public-private partnerships, along with support from development finance institutions, will need to shift focus to find the right solutions to these policy intervention challenges. When sponsoring policy supports community banking goals, like in the case of using REAP policies from the USDA, the impacts can be compounded. In the clean energy transition and carbon reduction goals, leveraging community banks to go beyond their traditional functions will be vital. Sharpening the institutional frameworks, precisely defining the boundaries of policy, and enhancing motivation for risk allocation all impact how optimally these goals are achieved. In renewable energy financing, shifting risk to community banks enables the achievement of the national climate change goals, while at the same time enhancing economic development and energy equity at the local level.

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