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DEVELOPMENT OF ENTREPRENEUR STRUCTURES IN THE FIELD OF RENEWABLE ENERGY THROUGH IMPROVING PUBLIC-PRIVATE PARTNERSHIP MECHANISMS

The development of decarbonization technologies and their deployment through the introduction and spread of innovative technology, which is required owing to climate change, is a significant precursor in the renewable energy sector. When it comes to creating technology to lower CO2 emissions and putting decarbonization plans into action, startups are crucial. The study, which was based on the integrative review methodology and system approach, showed that ongoing technological innovation, which permits the application of contemporary technologies to create effective and efficient solutions to the current challenges in the energy market, is what drives start-ups' growth momentum. Startups actively support decentralized energy models by investigating the application of technologies like local energy generation systems and microgrids. The results demonstrate that in order to maximize efficiency and profitability throughout the shift to renewable energy, new business models and technological innovation are needed, making these technologies scalable and financially feasible through integrated methods. The issue of private sector' motivation towards participation in public-private partnership is explored in the context of development of business structures and optimal matching of public and private partners for renewable energy projects. The findings contribute to enhancing the possibilities of better planning and designing policies in public-private partnership within renewable energy sector, and, moreover, can be used by sector entrepreneurs when considering decisions on participation in public-private partnership. Moreover, the effective implementation of renewable energy projects largely depends on the quality of the institutional environment and the stability of regulatory policies. In this context, public–private partnerships serve as an instrument for reducing investment risks and stimulating the innovative activity of startups. The synthesis of scientific sources indicates that the combination of public support with the entrepreneurial flexibility of the private sector creates favorable conditions for accelerating decarbonization processes. Thus, the development of startups within public–private partnerships contributes to the formation of a sustainable, innovation-driven, and competitive renewable energy sector.

Keywords: **green energy, business model, entrepreneurial structures, public–private partnership, innovations, private sector motivation, renewable energy**.
JEL Classification: L5, O2, Q2, Q4.

Introduction. Over the past ten years, the renewable energy sector has grown at an unprecedented rate thanks to technological advancements, declining costs, public and private investment, and global pledges to cut greenhouse gas emissions. 30% of the world's electricity is now produced by renewable energy, and global investment in the low-carbon energy transition exceeded $ 2 trillion in 2024. However, growing renewable energy capacity can improve energy security, lessen reliance on fossil fuel imports, and build resilient economies, so countries aren't investing in renewables merely because they are environmentally beneficial (Hinsdale, 2025).

Innovative infrastructure projects ranging from cutting-edge energy storage and grid management solutions to new solar and wind technologies are being developed by renewable

energy businesses today. While some concentrate on software for grid intelligence (Blindleister) or developing novel energy carriers like green hydrogen (Hystar), others concentrate on specialized hardware like floating wind turbine platforms (Gazelle Wind Power) or AI-driven energy storage optimization (tranXenergy).

At the same time, obtaining the initial funding required for project execution continues to be a major financial obstacle for renewable energy initiatives. Globally, governments have acknowledged this problem and have increasingly relied on the private sector to contribute significantly to these initiatives by utilizing their financial resources and knowledge (Othman & Khallaf, 2024). Adopting a Public-Private Partnership (PPP) as the delivery method is one common way to facilitate this collaboration between the public and private sectors in the context of renewable energy projects. Essentially, a concessionaire - typically made up of one or more private organizations - plays a key role in supplying the vital funding needed for renewable energy projects. Additionally, it actively participates in several stages of project development by taking on diverse duties that include project design, building, maintenance, and operation (Odhiambo et al., 2020). Involving a private sector organization makes sense since it allows taking use of their technical expertise and financial resources while also transferring some of the associated risks to them. Wide-ranging effects result from this dynamic, which eventually lowers project costs that the public sector bears (Mohsen et al., 2015). In the field of renewable energy, the idea of PPPs has become a pillar for cooperation between public and private organizations. These collaborations create a synergy between the goals of the public and commercial sectors, which benefits both parties and, consequently, the general public. PPPs have several benefits in renewable energy projects that should be further investigated. Among these benefits are (Raghutla & Kolati, 2023; Kostyrko et al., 2024; Pecheniuk et al., 2022):

• Access to private sector resources: Investing private sector funds in renewable energy projects is the most prominent benefit of PPPs. This is done in an effort to overcome the public sector's financial limitations, which prevent it from providing sufficient funding for large-scale renewable energy projects. By enabling private organizations to contribute significant financial resources, PPPs close this gap and hasten the start and completion of projects.

• Leveraging technical skills: When it comes to renewable energy initiatives, private enterprises usually have state-of-the-art technological expertise. This important information can be used to optimize project design, construction, and operation, which will increase productivity and save costs.

• Risk sharing: The inclusion of private businesses introduces a risk-sharing dynamic into renewable energy projects. These organizations are frequently willing to take on project risks, such as construction delays or cost overruns, in exchange for a portion of the project's returns. This risk allocation can lessen the strain on the public sector and boost project feasibility.

• Competition in the private sector promotes innovation and efficiency. In PPPs, private firms are encouraged to identify innovative and cost-effective ways to accomplish project objectives, which can lead to better project outcomes.

• Renewable energy projects require timely implementation, particularly in light of climate change and energy transition goals. PPPs can speed up project delivery by streamlining decision-making procedures and instilling a feeling of urgency in private partners.

• Long-term sustainability: The operational lifespans of renewable energy installations are frequently rather long. In order to maintain the project's performance over time, the involvement of private-sector partners guarantees continuous maintenance, operation, and modifications as needed.

• Public benefit: PPPs are ultimately intended to help the broader public. These collaborations support the growth of renewable energy capacity by utilizing private capital and knowledge, which lowers greenhouse gas emissions, improves energy security, and promotes a cleaner and more sustainable future.

PPPs are essential for renewable energy entrepreneurship because they combine finance and expertise from the private sector with government backing to create projects. In order to reduce entry barriers, private businesses provide innovation, funding, and technology to construct and run projects like solar farms and wind turbines, while governments provide regulatory stability and incentives.

Public-private joint ventures (PPJVs) are now crucial for advancing renewable energy projects and filling financial shortfalls, according to experts. These collaborations combine government policy support with private sector investment and expertise to reach net-zero emissions by 2050, which will require more than $ 3.5 trillion yearly (Casady et al., 2024). Each partner in renewable energy PPJVs contributes special qualities. Land access, regulatory facilitation, and policy direction are usually

handled by public agencies, who also frequently streamline permitting procedures and provide financial incentives. Conversely, private partners contribute money, cutting-edge technology, and operational know-how. They take on the performance-related risks and oversee project development, construction, and continuing operations. In the meantime, PPPs have an effect on entrepreneurial structures as well because of their general nature and particular structure.

While a lot of research has been done on the advantages of PPP in the state's renewable energy sector, much less focus has been placed on examining the advantages that businesses receive from taking part in these projects. Even less research has been done on the development of business structures within the PPP landscape. Practice, however, demonstrates that even SMEs can take part in green energy PPP projects. For instance, in Sub-Saharan Africa, a decentralized approach was created that offers helpful advice on how small power producers and mini-grid operators can provide both electrification and renewable energy in rural areas. In addition to a number of hybrid combinations that are starting to appear in Africa and other regions, it explains the fundamental kinds of off-grid and on-grid small power producers (Obi et al., 2026).

Overall, public-private partnership participation has a substantial impact on a company's business model, influencing innovation, risk management, and operational efficiency. Entrepreneurial companies involved in green energy Public-Private Partnerships (PPPs) change their business models by adopting vertically integrated structures, embracing service-oriented models (such as Energy-as-a-Service), and leveraging digital platforms to facilitate risk sharing, access stable funding, and take advantage of government incentives. As a result, business models shape the entrepreneurial structures within the sector. With this in mind, investigating of patterns observed in development of business strictures within renewable energy sector represent highly relevant scientific task.

Literature Review. Mundonde and Makoni (2025) examine the determinants impacting renewable energy infrastructure public-private partnership (PPP) finance using data from 28 countries spanning the years 1996 to 2024. A composite institutional quality indicator was created using Principal Component Analysis (PCA). To capture short- and long-term dynamics, the analysis uses a panel econometric framework, the autoregressive distributed lag (ARDL) model. The findings illustrate the importance of the time dimension in renewable energy PPP finance. In the short run, none of the predictor factors are significant, highlighting the intrinsically long-term nature of renewable energy PPP investments. However, in the long run, gross domestic product per capita, inflation dynamics, energy transmission efficiency, and institutional quality have been recognized as major drivers of renewable energy investment. The findings indicate that enhancing sector-specific regulatory frameworks and improving several dimensions of institutional quality, as defined by the World Governance Indicators, can help to attract private investments in energy PPP projects. These institutional reforms, together with growth-oriented macroeconomic policies, would help to make renewable energy markets more appealing while lowering exposure to macroeconomic and institutional risks.

According to Zaman (2025), the renewable energy sector, particularly in the context of decentralized systems in developing nations, includes a range of business models aimed at addressing various concerns connected to energy access, cost, and sustainability (Table 1). These models are widely classified into three types: classic, innovative, hybrid, and community-based business models. Each model reflects different levels of technological integration, market orientation, and stakeholder involvement, tailored to distinct socioeconomic and infrastructure constraints.

Key business model changes observed within private companies' participation in PPP are considered in a range of publications and can be summarized as follows (see Table 2).

Participating in green energy PPPs allows entrepreneurial companies to transition from risky standalone operations to more stable, integrated, and service-oriented business models, supported by public and private partners' combined resources and policy frameworks (Fleta-Asín & Munoz, 2021).

According to Bendig et al. (2025), the introduction and development of new sustainable technologies and business models are supported by entrepreneurship, which is a major force behind innovation in the renewable energy sector. By questioning established paradigms and utilizing cutting-edge technologies to satisfy changing market demands, startups create new business models, promote innovation, and accelerate economic growth. By encouraging the creation and uptake of novel energy solutions and playing a critical part in the shift towards a more sustainable

energy future, such entrepreneurial endeavors greatly contribute to developments within the renewable energy sector.

Decarbonization can be accelerated by startups in low-carbon energy technology, according to studies (Leisen et al., 2019). Furthermore, research shows that rural entrepreneurship promotes energy justice in these places by giving people access to energy for the first time in many locations as part of electrification efforts (Lembi et al., 2025).

Table 1 – **Types of business models in decentralized renewable energy systems**

Business Model Type	Key Characteristics	Examples
Models of traditional nature	Centralized generation, large-scale infrastructure, high capital investment, utility-based	Government or commercial utility grids; fossil-fueled or concentrated solar/wind plants
Innovative models	Technology-enabled, user-centric, pay-as-you-go, peer-to-peer trading, and Energy-as-aService (EaaS)	PAYG solar (e.g., M-KOPA in Kenya), P2P blockchain platforms
Hybrid models	integrates flexible finance, community or private innovation, and conventional utilities	Mobile banking and public-private solar microgrids in South Asia
Community-based models	Economic empowerment, skill development, cooperative structures, and local ownership and involvement	Energy cooperatives in Europe; community solar in rural Tanzania

Source: Zaman (2025)

Table 2 – **Key business model changes in private companies participating in PPP**

Change	Description
Transition to Integrated Value Chains	Business models that are more vertically integrated are adopted by entrepreneurial enterprises. This enables companies to more effectively distribute risks throughout the value chain, from the procurement and production of raw materials to the local integration and maintenance of technology, a structure promoted by cooperative government-business initiatives
Adoption of the Energy-as-a-Service (EaaS) Model	Businesses are increasingly offering complete energy services, such as effective consumption management, renewable energy sources, and storage solutions, rather than just selling energy or equipment. This changes the emphasis from a transaction based on commodities to a long-term service agreement
Distributed Energy Resources (DERs) Development	PPPs make it easier to invest in decentralized generation systems like micro-wind turbines and micro-photovoltaic installations. This enables businesses to develop local power sources, reducing dependency on central networks and boosting community energy independence and resilience
Making Use of AI and Digital Platforms	Businesses incorporate digital platforms that link producers, distributors, and consumers using the Internet of Things (IoT), artificial intelligence (AI), and maybe blockchain. This improves energy exchange's adaptability, transparency, and process automation
Prioritize Risk Reduction and Consistent Income	By offering government assurances, tax incentives, and a structure for risk-sharing, PPPs assist entrepreneurial enterprises in overcoming obstacles including high upfront investment costs and policy volatility. This promotes the adoption of business models with more reliable sources of income, including availability fees or long-term Power Purchase Agreements (PPAs).
Transferring Knowledge and Developing Local Capabilities	Entrepreneurial companies provide technology and experience to the public sector and local communities as part of the PPP structure, which can increase local capacity and result in the creation of local supply chains.
From Product to "Prosumer" Involvement	Business strategies change to actively involve customers as "prosumers" (energy producers and consumers), giving them greater control over their energy sources and production techniques.

Source: (Liu et al., 2024; Kopanska et al., 2024)

The literature now in publication offers insightful information, especially when it comes to newly developed business models in the industry. These models, which enable strategic positioning and competitive advantages in dynamic marketplaces, are methodical techniques created by new ventures to create, deliver, and capture value (Krishna et al., 2023). Beyond new business models,

entrepreneurship includes a wider range of activities, such as spotting, evaluating, and seizing opportunities - often using creative methods and starting new companies (Domegni & Azouma, 2022). It entails an entrepreneurial mindset centered on identifying and pursuing possible endeavors, which often results in the launch of start-ups (Jenkins et al., 2016).

Public-private partnerships have been highlighted in the literature as a way to increase energy access in underdeveloped countries (particularly when it comes to increasing access to renewable energy through pro-poor public-private partnerships in the developing world). Both public and private-led strategies, according to Rehman et al. (2017), have failed to independently produce the required acceleration and continuity to provide universal energy access. Even while both public and private sector-led projects have intrinsic advantages, they are unable to fully achieve the primary goal of long-term energy access facilitation for the impoverished due to common systemic inefficiencies and insufficient capacities. Additionally, the number of individuals who remained energy poor 15 years later would stay the same even if the necessary investments were sufficiently funded because the current rate of population growth consistently exceeds the rate of interventions. Therefore, it is not only necessary to give the current population bulk access to energy, but it is also necessary to do so quickly enough to really lower the number of energy-poor people worldwide. To support the development of an enabling ecosystem and a viable value chain that successfully and efficiently delivers energy solutions to the last mile, an alternative strategy that contrasts the social welfare goals of public sector-led initiatives with the enterprise development and growth goals of the private sector must be investigated. Through a complimentary blend of social and economic objectives, such a pro-poor hybrid model will essentially solve the shortcomings and inefficiencies of both public and private systems while leveraging their strengths. In order to drive individual components of a cohesive energy provisioning system, the model enables corporate, institutional, and individual collaborations. This makes the system fluid, dynamic, adaptable, and maneuverable within relationships, structures, and organizations. For precise role definitions, appropriate planning, and execution, policy level support and related regulatory frameworks are essential.

Researchers further stress that conflicts between the public sponsor's "quality improvement" goals and the private partner's "cost saving" goals worsen PPP project inefficiencies, resulting in information asymmetry, adverse selection, and moral hazards (Ibrahim & Jantan, 2024). The ability of the private partner to internalize life-cycle costs and produce returns on investment is crucial to the success of PPP projects. Due to the enforcement of stringent contracts, public-private partnerships may limit the dynamism between the social-welfare mandate of public partners and the profitability considerations of private actors, even though quality considerations are crucial in the delivery of energy services (Wojewnik-Filipkowska & Węgrzyn, 2019). In order to provide the poor with high-quality energy services, it may be necessary to make trade-offs between the objectives of public and private actors without upsetting the equilibrium of the relationship. Additionally, increasing transparency among partnerships can greatly reduce the transaction costs related to various public-private partnership activities.

Evidently, meanwhile, the success of PPP projects is unlikely possible without efficient entrepreneurial (business) structure and business model, namely suitable for working within PPP. However, this domain of research did not receive proper attention in scientific community, and significant research gap exists in this field.

Research methodology. The purpose of this study is to conduct an integrative review and systematize the results of empirical and theoretical research, conclusions, and recommendations presented in the literature on the role of technological innovations, business models, and motivational mechanisms in the development of startups and the implementation of renewable energy projects within public–private partnerships.

The study is based on systemic approach and integrative review toolkit. It implied the following stages (tasks):

1. Planning task: The primary keywords and search engines that will be utilized to find the papers to be included in the sample for integrative review were determined by this job. Several major search engines were used in this investigation to locate relevant papers. These search engines were ScienceDirect, Springer, ResearchGate, MDPI, and IEEE Xplore. The following keywords were adopted to find papers: "renewable energy" and "public-private partnership" in combination with one or more of the following words: "critical success factors", "business models", "organizational structures", "PPP participants motivation".

2. Search task: The main objective of this work was to search for papers utilizing the indicated search engines using the identified keywords.

3. Inclusion/exclusion criteria: Determining the inclusion and exclusion criteria that will be applied to filter the data was the main goal of this work. The inclusion criteria for this study were designed to choose papers about renewable energy PPPs that were published after 2012. The study did not include papers written in a language other than English.

4. Screening task: The goal of this work was to review each paper's title, abstract, keywords, and conclusion. This made sure that every paper was within the intended scope for this particular study.

5. Reporting task: Identifying the main outcomes of the literature review process.

This research flow is presented in Fig. 1 below.

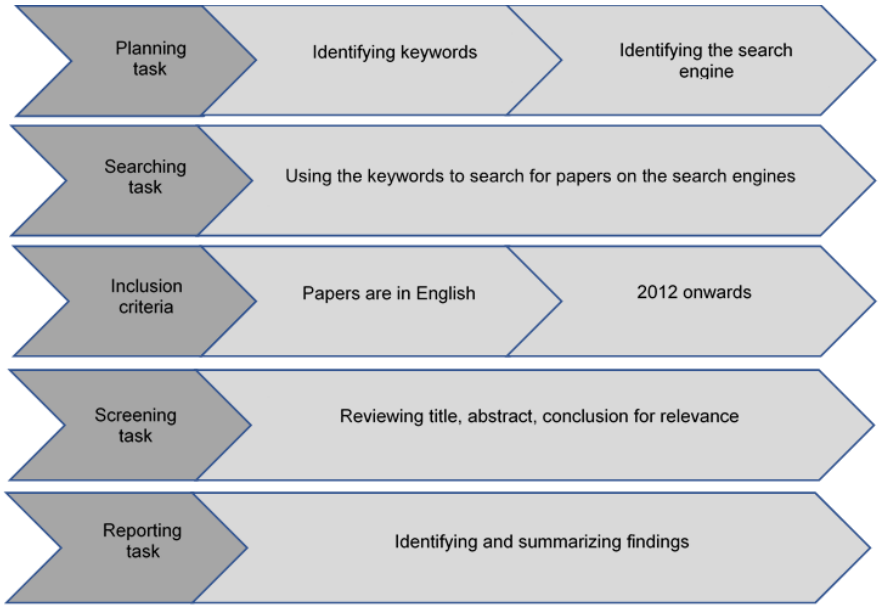

Fig. 1. Research process followed in the study

Source: developed by the authors

Main results. The analysis of scientific ideas, practical cases, as well as the results of theoretical and empirical studies presented in the contemporary academic literature made it possible to identify the most significant contributions and to synthesize them in accordance with the key aspects of the issues related to startup development and the implementation of renewable energy projects within public–private partnerships.

Green energy entrepreneurship in the context of renewable energy paradigm. Particularly in underdeveloped nations, green energy entrepreneurship - which is mostly concentrated on localized renewable power - is emerging as a key actor in the search for equitable and sustainable energy solutions. These areas frequently struggle with enduring problems like unstable energy supply, environmental deterioration, and the demand for economic expansion. Decentralized renewable energy (DRE) systems, which enable communities to access local renewable resources like sun, wind, and biomass, are developing as viable substitutes for conventional fossil fuel-based infrastructures in this environment. This change is not only about expanding access to energy, but it is also stimulating economic empowerment, encouraging innovation, and encouraging environmental stewardship at the local level (Adu-Kankam & Camarinha-Matos, 2019). By creating creative business models that are adapted to the unique socioeconomic and infrastructure challenges of developing countries, entrepreneurs in the renewable energy sector are changing the narrative. These solutions are designed to promote equal participation and long-term sustainability while overcoming the common obstacles presented by large initial investments and restricted grid access.

As a result, green energy entrepreneurship is becoming more widely acknowledged as a vital force behind inclusive growth, assisting national and international initiatives for sustainable development and climate change mitigation. Digital platforms, innovative funding methods, and community-based projects are some of the noteworthy new company models. For example, community solar programs demonstrate cooperative ownership arrangements that allow people, particularly those who might not have enough money or suitable rooftops, to invest in and profit from renewable energy systems (Sippert, 2022).

PPP in renewable energy sector: models, peculiarities, and the context for private sector. In renewable energy, PPP models entail collaborations between public and private organizations to finance, create, and run projects, utilizing private resources and knowledge for the good of the public. Build-Own-Operate-Transfer (BOOT), Build-Operate-Transfer (BOT), and concession agreements are common models that are frequently coupled with Power Purchase Agreements (PPAs) to generate income through a mix of output and capacity charges. By bridging governmental funding gaps with private investment and innovation, these approaches help reduce risk for both sides and expedite the energy transition (Casady et al., 2024).

Businesses gain from renewable energy public-private partnerships because they reduce energy costs, stabilize prices, and create new revenue streams through power sales. Additionally, these collaborations enhance a business's reputation, draw in capital and clients, and provide access to subsidies and incentives from the government. By combining resources and knowledge for major projects, the partnership aids in overcoming financial obstacles.

Meanwhile, as Kopanska et al. (2024) properly assert, it is vital to stress that study of private motivations in PPPs remains challenging. In this regard, there are typically two approaches in the literature. Analyzing the quantity and size of PPPs that are currently in place in various nations or areas is the first strategy (Xiong et al., 2022). However, it is challenging to distinguish between the private and public reasons in such assessments. Surveys and interviews with business stakeholders, including banks, constitute the second strategy (Zhu et al., 2018). However, these studies may suffer from respondent subjectivity, as well as response and non-response bias. The true choices of private businesses to participate in PPPs, including renewable energy projects, are directly related to the business model and structure of the company.

Renewable energy entrepreneurs are developing new business models and value propositions that are transforming the way energy is delivered. They collectively provide a considerably wider range of products and services than traditional utilities. Large operators offer power on a utility scale. Mini-grid operators are experimenting with energy service (servitization) strategies to increase value. Alternative payment mechanisms, such as pay-as-you-go (PAYG), are allowing lower-income households to gain access to power, frequently for the first time. This process of "creative destruction" is beneficial to innovation, growth, and socioeconomic development, as evidenced by the diversity of emerging business models observed in Kenya, South Africa, Pakistan, and Uganda, four countries with highly innovative startup ecosystems that could serve as a model for other renewables markets (Fankhauser et al., 2024). In Kenya and South Africa, 35-40% of renewables enterprises provide servitisation models, but 50-75% of renewables investment goes to these solutions. In Pakistan, more than 90% of startup investment goes to service-based initiatives. These figures highlight the shift to an innovative, service-based business model. Renewable energy businesses appreciate the scalability and flexibility that these models provide in a continually changing market. Renewable energy entrepreneurs are moving beyond the traditional frameworks of sale and resale by adopting new revenue models, allowing them to better address the diversified demands of both enterprises and consumers (Fankhauser et al., 2024).

In this connection, it is appropriate to highlight Othman and Khallaf's (2024) study. The authors conduct a thorough literature study and questionnaire to provide an overview of the global renewable energy PPP market. The responses of 86 experts were collected and grouped according to whether they have experience in developed or developing countries. The findings revealed that political and regulatory constraints are the most significant barriers to renewable energy PPPs worldwide. While the experts emphasized that the public sector is incapable of properly identifying, valuing, or transferring risks, they also praised the private sector for its efficiency in dealing with hazards. Othman and Khallaf (2024) provide empirical data for comparing the efficiency of the public and private sectors (see Figure 2).

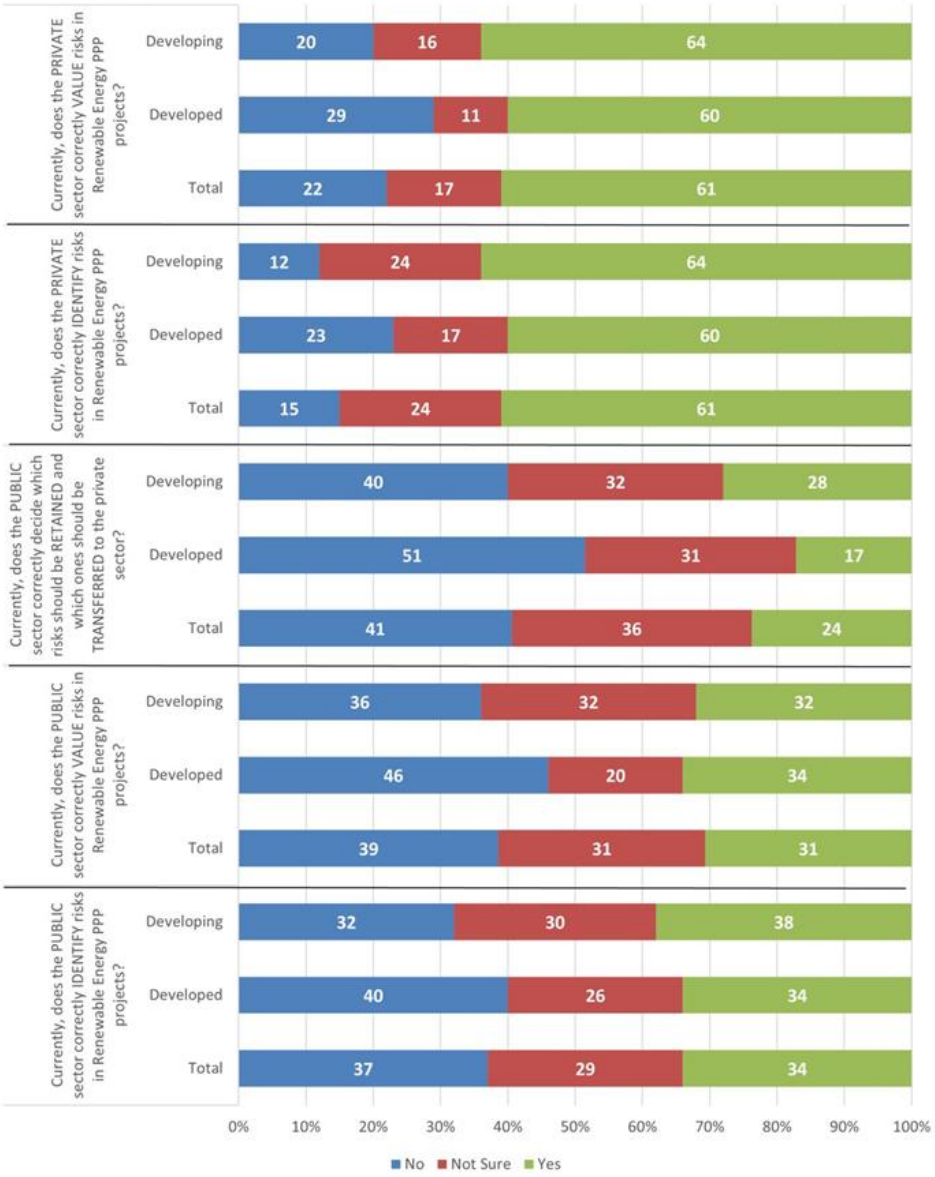

Fig. 2. Comparison between the efficiency of the public and private sectors in renewable energy PPP

Source: Othman and Khallaf (2024)

** presented in original*

The figure makes clear that just roughly 35% of the experts think the public sector is capable of properly identifying and valuing risks. Only 24% of the experts (17% from developed countries and 28% from developing countries) agreed that the public sector can choose to retain and transfer risks appropriately when asked about this ability. However, most of the experts thought that the public sector was capable of properly identifying and valuing risks. The ability of the private sector to accurately identify and value risks is generally agreed upon by 61% of the experts (60% of experts from affluent nations and 64% of experts from developing countries). This demonstrates that, in

contrast to their counterpart, the private sector is an effective party that can manage risks. These findings emphasize the significance of utilizing the private sector's involvement in PPPs for renewable energy projects. They demonstrate that putting these kinds of initiatives under PPPs should increase their effectiveness.

In turn, the goal, paradigm, concept, and scope of a specific PPP project will determine how well a company's structure and business plan work. This idea would enable the appropriate "matching" of public and private partners as well as the selection of the best PPP model for each project and project portfolio.

Power Purchase Agreements (PPAs), which are long-term energy sales contracts, Energy-as-a-Service (EaaS), which offers a whole range of energy services, and vertically integrated models, which manage every stage of a project, are some of the business models used by renewable energy companies. Large, publicly listed companies like NextEra Energy and smaller, community-owned or cooperative models are examples of company structures. Many of them concentrate on certain industries, such as the production of solar modules (like Waaree Energies) or the development of large-scale projects (like Adani Green Energy). Based on PPP participation motive, Table 3 shows some potential forms for entrepreneurial businesses.

Table 3 **– Possible entrepreneurial companies' structures determined by PPP participation motivation**

Structure	Description
Large corporations	Numerous significant companies operate across various renewable technologies and geographical areas, have diversified portfolios, and are publicly listed
Specialized firms	Businesses might concentrate on a particular segment of the value chain, like producing solar panels or creating and managing massive wind and solar farms
Utility-owned	Conventional utility companies are increasingly incorporating renewable energy, sometimes by implementing internal frameworks for the growth of renewable energy
Community and municipal ownership	Structures that guarantee local benefits and control by having municipalities or local groups own the renewable energy assets.

Source: compiled by the authors based on (Kopanska et al., 2024; Zhang et al., 2018)

Private sector motivation: issue of structures and business models. In the shift to net zero, business structures are crucial. In addition to promoting green technology, the government must to pay attention to the demands of business owners and assist them in expanding their creative business plans, which can be successfully accomplished through PPP. The promotion of particular business models should be the main goal of energy entrepreneurship policy.

Flexible PPP agreements with more successful public partners are preferred by private companies. They are hesitant to assume demand risk since it creates more financial risk and is linked to higher TC. On the other hand, they are more willing to take on access risk in the form of availability fees. This is because private businesses have the resources to handle this risk because of their expertise in this field (Feng et al., 2023). In order to facilitate the development of PPPs for inexperienced public institutions, standard modelled PPP contracts are prepared, as is the case in Ukraine. It can, however, indicate that the contract is not customized to the specifics of a given project. However, it also implies that the government has become a new shareholder in the project, which makes it more rigid and raises transaction costs for private companies.

Specifically, a private business taking part in a PPP may use a flat organizational structure for the project's internal operations. This modifies the private company's internal operations but leaves the multi-party PPP's overall structure unchanged. A PPP project with a flat organizational structure has fewer levels of administration, which facilitates quicker executive-employee communication and increased employee autonomy. A flat structure would be implemented within the private entity or a particular project team, not the entire partnership, to improve decision-making, flexibility, and communication, although it may present clarity challenges as the organization expands. This is in contrast to the traditional PPP structure, which is complicated with many parties.

Conclusion. In the course of the study, aimed at conducting an integrative review and systematizing the results of theoretical and empirical research, it was found that technological innovations and new business models are key drivers of startup development and the effectiveness of renewable energy projects within public-private partnerships. The synthesis of scientific sources

confirmed the decisive role of private sector motivation mechanisms in ensuring effective risk allocation, financial sustainability, and the scalability of such projects.

Assessing the success of renewable energy PPPs requires an understanding of how the public and private sectors perform. It offers insightful information about how each sector might enhance its contribution to project success. The findings revealed a significant difference in each sector's perceived strengths. It was frequently believed that the public sector lacked the necessary resources to successfully manage risks. This calls into question whether the public sector should be the main force behind such initiatives, especially when it comes to high-risk initiatives like renewable energy. On the other hand, governments seeking to reduce their exposure to operational and financial risks found the private sector to be an appealing partner because it was typically thought to be more effective at managing risks. This result emphasizes the value of a cooperative strategy that makes use of both sectors' advantages. While the private sector may contribute its knowledge of project management, risk reduction, and innovation, governments should concentrate on establishing a favorable legislative climate, offering incentives, and guaranteeing regulatory stability. This collaborative approach, in particular, is a driver of changes and development of business structures in the sector of renewable energy, shaping the motivation of private sector to evolve to more innovative organizational structures and business models.

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РОЗВИТОК ПІДПРИЄМНИЦЬКИХ СТРУКТУР У СФЕРІ ВІДНОВЛЮВАЛЬНОЇ ЕНЕРГЕТИКИ ЧЕРЕЗ УДОСКОНАЛЕННЯ МЕХАНІЗМІВ ДЕРЖАВНО-ПРИВАТНОГО ПАРТНЕРСТВА

Важливою умовою ефективності у секторі відновлюваної енергетики є розвиток технологій декарбонізації та їх впровадження шляхом запровадження та поширення інноваційних технологій, що є необхідним через зміни клімату. Стартапи відіграють ключову роль у створенні технологій для зниження викидів CO2 та реалізації планів декарбонізації. Дослідження, яке базувалося на методології інтегративного огляду та системному підході, показало, що постійні технологічні інновації, які дозволяють застосовувати сучасні технології для створення ефективних і дієвих рішень поточних проблем на енергетичному ринку, є рушійною силою зростання стартапів. Стартапи активно підтримують децентралізовані енергетичні моделі, досліджуючи застосування таких технологій, як локальні системи генерації енергії та мікромережі. Результати показують, що для максимізації ефективності та прибутковості під час переходу на відновлювані джерела енергії необхідні нові бізнес-моделі та технологічні інновації, які роблять ці технології масштабованими та фінансово доцільними завдяки інтегрованим методам. Питання мотивації приватного сектору до участі в державно-приватних партнерствах досліджується в контексті розвитку бізнес-структур та оптимального поєднання державних і приватних партнерів для проектів у сфері відновлюваної енергетики. Отримані результати сприяють покращенню можливостей більш ефективного планування та розробки політики в сфері державно-приватного партнерства у секторі відновлюваної енергетики, а також можуть бути використані підприємцями сектору при прийнятті рішень щодо участі в державно-приватних партнерствах. Крім того, ефективна реалізація проєктів у сфері відновлюваної енергетики значною мірою залежить від якості інституційного середовища та стабільності регуляторної політики. У цьому контексті державно-приватне партнерство виступає інструментом зниження інвестиційних ризиків та активізації інноваційної діяльності стартапів. Систематизація наукових джерел свідчить, що поєднання державної підтримки з підприємницькою гнучкістю приватного сектору створює передумови для прискорення декарбонізаційних процесів. Таким чином, розвиток стартапів у межах державно-приватних партнерств сприяє формуванню стійкої, інноваційно орієнтованої та конкурентоспроможної моделі відновлюваної енергетики.

Ключові слова: **зелена енергія, бізнес-модель, підприємницькі структури, державно-приватне партнерство, інновації, мотивація приватного сектора, відновлювальна енергетика**.

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