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GREEN PUBLIC-PRIVATE PARTNERSHIPS (PPPs) AS AN INSTRUMENT FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

The purpose of this paper is to analyse green Public-Private Partnerships (PPPs) as an instrument to contribute to sustainable development. The research of the green PPPs in their international context and the innovative mechanisms for their financial support and implementation is made through a review of their role in the global sustainable development agenda and the policy of the European Union as well as a survey of several case studies. The conceptual framework contains the theoretical background of green PPPs as innovative investment solutions, and the discussion of the results is presented afterwards. The author gives recommendations for overcoming the challenges of the green economy, especially the perception of the collaboration between the private and public sectors in accomplishing the Sustainable Development Goals (SDGs). Particular attention is paid to the new dimensions of cooperation as one of the key factors for achieving better socio-economic and environmental conditions.

KEYWORDS

Green PPPs, Green funds, Green platforms, Sustainable development, Innovative solutions

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1. INTRODUCTION

Modern theoretical views on PPP and good practices in the implementation of large-scale investment projects in the world exceed the traditional role of the private sector in the process of providing public services. In its varieties, PPP is perceived as a long-term agreement between a government entity and a private party in the fulfilment of initiatives on a national and international level that solve socio-economic problems, provide public assets or services, and promote sustainable development of the economies and civil societies (WB, 2017, p. 5).

In a broader sense, PPPs cover the full range of cooperation between the public and private sectors. Any relationship involving a combination of private and non-governmental or public sector activities is defined as a "partnership". American authors, such as Lindner, define PPP as "a form of cooperation between the state and private business" (Lindner, 1999, p.35). In the United States, for example, in addition to building transport facilities and toll roads, private prisons and detention facilities, PPPs also prioritize education policy, social work, health and medical services, as well as a great number of other public activities (from education to urban renewal and environmental policy). This broader framework includes partnerships at the "policy level" and at the "project level", especially concerning initiatives related to environmental protection and the achievement of economic growth through sustainable development to meet the goals of the green economy. The policy-level partnerships combine the efforts of the public and private sectors in project decision-making and policy formulation. In the field of energy, for example, policy-level partnerships assess the benefits of different types of energy sources, including renewables, basic operating rules, investment instruments and dispute resolution. In contrast, the partnerships at the project level focus on specific sites, such as the construction of new electric power stations to attract private capital and ensure stable project management. In some countries, partnerships at policy, program and project levels often go hand in hand, in others - this is not always the case (UN, 2016, pp.3-8).

The range of organizational and managerial structures, methods of financing and technological innovations in PPPs are extremely rich. It is recognized that the commitment to PPPs varies from country to country, and that experience has shown that the transition to a green economy tends to be rather slow from the usual adversarial relationship between the public and private sectors to the desired partnership in search of the common good and the best forms of attaining this (WBCSD, 2004). According to the OECD and WBCSD, the challenge for businesses is to move towards clear performance indicators for sustainable development and to align them with the broader needs of society.

This paper aims to analyse the green PPPs as an instrument to contribute to sustainable development. To reach this objective several goals have been set: to reveal the conceptual framework of the green PPPs, to trace their rationale in the global and European context and to discuss their distinctive characteristics. Some best practices in the implementation of green public-private initiatives have been used to illustrate the diversity of these innovative mechanisms.

The methodology of the paper is based on desk research and case studies. A literature review on green PPPs and their role in the sustainable development agenda has been carried out in order to form their conceptual and contextual framework. Data from government documents, guidelines of UNIDO and the World Bank, documents of UN, UNECE, UNDP, EC, etc. have been used for analysis purposes, as well as research studies, scientific journals, and other secondary sources to generate a comprehensive idea of this challenging type of cooperation. The information derived from the survey of books, academic papers, websites, and all scientific published texts related to sustainable development and the impact of the green PPPs on a global level on the fulfilment of the Sustainable Development Goals (SDGs), has been harnessed through analysis, synthesis, and comparison. Induction and deduction methods have been applied in drawing conclusions.

2. CONCEPTUAL FRAMEWORK OF THE GREEN PUBLIC-PRIVATE INITIATIVES AS INNOVATIVE INVESTMENT SOLUTIONS

One of the first countries which implements the idea of greening government and green PPPs is the UK with the publishing in 2002 of a Guidance note on how to include environmental considerations within PPPs and PFI projects. The guidelines show that greening and private finance are not mutually exclusive. On the contrary, they both look at the service to be provided and the whole life costs of doing so – being green is about eliminating wastefulness. The focus is put on value for money and not the lowest cost (Green PPPs, 2002, p.4). Greening does not just stop with the award of the contract – the organization needs to work with suppliers to ensure improved environmental performance throughout the whole life of the project.

In the last few years, UNIDO coined the concept "green industry" and promoted the green industry concept to place sustainable industrial development in the context of new global sustainable development challenges. Green industry means economies striving for a more sustainable pathway of growth, by undertaking green public investments and implementing public policy initiatives that encourage environmentally responsible private investments (UNIDO, 2011, pp.9-11). The green industry is a growing and diverse sector that covers all types of services and technologies aimed at contributing to reducing negative environmental impacts or addressing the consequences of various forms of pollution. This includes material recovery, recycling companies, waste management and treatment companies, as well as companies that transport waste. Further examples include engineering companies that specialize in wastewater treatment, air pollution control and waste treatment equipment. The sector also encompasses environmental and energy consultants, in addition to the providers of integrated solutions, for example, energy service companies (esCOs) that offer design, implementation of energy-saving projects, energy conservation, energy infrastructure outsourcing, power generation, energy supply, and risk management. A central segment of the sector is monitoring, measuring and analysis providers. Green industries also include companies that manufacture and install renewable energy equipment and companies that develop and produce clean technologies (UNIDO, 2011, p.14).

JOWETT 2022, 2(05), 22;
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The constant concern about the environment and the measures undertaken by the governments creates a new trend, namely the "green" economy, which changes more and more aspects of economic life and international business. (Boeva, et.al., 2015, p.6). Green PPPs are inevitably connected with the concept of sustainable development whose most widely recognized definition is given by the Norwegian Prime Minister Gro Harlem Brundtland in the Report of the World Commission on Environment and Development: Our Common Future released in 1987. That is a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN, 1987, p.16). Basically, PPPs for sustainable development have been in operation for several decades. On one hand, they are a result of the changing nature of public policymaking. This is captured by the so-called shift from "government" to "governance", signalling that governments are no longer the only providers of public policy but increasingly engage private actors (Marx, 2019, pp.1-2).

The United Nations are actively encouraging governments to use PPPs in infrastructure for sustainable development and poverty alleviation, mindful of the limited resources available to governments to meet the huge development challenges of the era. The Monterrey Declaration, adopted at the International Conference on Financing for Development in 2002, recognizes PPPs as an important instrument in creating an environment favourable to the normal functioning of business and the attraction of investment, an essential element in generating employment and creating wealth. Not least because of this advocacy, a great number of governments are taking on board this concept and are formulating legislation and policy to mobilize resources outside the public sector (Ryan, 2004, p.7-8).

It is difficult to distinguish green PPPs from PPPs for sustainable development. The following quote from the Brundtland Report is quite convincing: "The concept of sustainable development does imply limits - not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. Technology and social organization can be both managed and improved to make way for a new era of economic growth" (UN, 1987, p.160). It can be reasonably argued that green PPPs are PPPs for sustainable development in their essence because they also pursue economic growth, social benefits, and environmental protection. Some banks have established methodologies for evaluating green projects and thus approve green PPP financing (UN, 2016). They use tools and frameworks to prioritize projects while taking into consideration social and environmental factors (e.g., Social Cost Benefit Analysis versus Economic Internal Rate of Return). These tools could, however, be costly, time-consuming, and unfeasible for government authorities with limited capacity.

Here are some distinctive features that make a PPP for sustainable development different from the traditional PPP:

• Type of partnership. Although some partnerships are set up to shape policy, determine priorities and coordinate the efforts of organizations from different sectors (i.e., renewable energy strategies, healthcare issues, and education goals), they must integrate sustainability concerns. The green initiative promotes sustainable

patterns of production and consumption i.e., patterns that are resource and energy-efficient, low-carbon and low-waste, non-polluting and safe, and which produce products that are responsibly managed throughout their lifecycle. "The Green Industry agenda covers the greening of industries, under which all industries continuously improve their resource productivity and environmental performance. It also aims to create green industries, that deliver environmental goods and services in an industrial manner, including, for example, waste management and recycling services, renewable energy technologies, and environmental analytical and advisory services" (UNIDO, 2011, p.9).

There are significant differences between partnerships, which are economic in nature and whose final goal is profit, and those related to social, education and other policies, basically due to the need to provide funding. Government interventions include the adoption of standards, labelling systems, procurement policy, regulatory innovation, and platforms, as well as technical and financial support to the business. Partnerships among governments, the private sector and civil society very often explore new regulatory models and coordinate different economic activities. Since the PPPs unite the efforts of different actors the key issue is how the partnership is managed and who takes the lead so that potential conflicts of interest can be put up. Scholars argue if the state or the private company is more trustworthy in the role of the "rule taker". Many examples exist in both directions. Obviously, the performance led by trust, constant exchange of information and flexibility as basic principles of collaboration leads to success in sustainability (Marx, 2019, pp.5-6).

• Type of services. Emphasis is placed on services traditionally provided by the government and transferred to the private sector in the field of economic or social infrastructure and protection of the environment. Promoting wider social and environmental benefits – by addressing health, safety, and environmental concerns of those living and working in the area a project can have a significant impact on improving the morale and well-being of the community. Usually, the government or municipality pays for services provided by private businesses through infrastructure owned or leased by them as part of the service package. Keeping the norms and standards in relation to the sustainability the partners pursue, is of crucial importance.

Governments, particularly those in developing countries, face numerous challenges in strengthening their education systems. Inadequate infrastructure facilities, poor quality of staff, and outdated curricula are major issues faced by public sector education systems. Governments face almost similar issues with technical and vocational education. While private schooling addresses most of these issues, it is costly and unaffordable to many. Some countries have responded to these challenges by promoting PPPs as a means to improve the delivery and financing of education facilities and services. However, PPPs in this sector are quite different from the ones in the economic infrastructure sectors. PPP projects in education include a focus on providing quality educational facilities and services without relying on user fees as the main source of revenue. For instance, governments can explore green infrastructure creation through PPP arrangements when they envisage adding capacities. Likewise, private management and capacity-building initiatives may be used to increase the

JOWETT 2022, 2(05), 22; https://doi.org/10.52459/jowett25221122

accessibility of quality education in existing public schools in the environment-friendly surrounding. Other initiatives in education include voucher-based systems and charter schools although there are not considered typical PPP projects as per the usual definition. Voucher systems aim to leverage the infrastructure and services of already existing private schools for the provision of high-quality education to government-sponsored students. This system relieves the government of the responsibility associated with the creation of new school facilities. Charter schools are another way of tapping private sector resources to provide education services. These schools are privately operated but publicly financed (UN, 2016, p.24). Distant learning and education at home (not only in times of severe pandemics) complement the sustainable and "green" elements of the partnership.

• Innovation. The PPP approach gives priority to the quality characteristics of the product and provides more opportunities and incentives for bidders to offer innovative solutions that meet the requirements for high quality, low costs, and better living conditions. Innovation, where public-private collaboration can result in long-term certainty for private sector innovation investments, stimulate "green" entrepreneurship and help establish networks that support innovative outcomes. Many examples can be pointed out referring to the "greening" of the cities and buildings in the USA (Steedman, et.al., 2014, pp.1-42) and the countries in South-East Asia, creating a clean environment through decarbonization of the cities like the Tokyo waste-to-power model (Hongo, 2016, p.20), adoption of digital technologies in waste management modernization in Egypt, Colombia and Mexico, expansion and development of IT networks in Spain and Germany, facilitating the access to touristic attractions by modernized cable cars in Peru, improving elderly people's living standards by providing users with telematic care in Spain, etc. (IESE Case Studies, 2020).

Initiatives in Astana, Birmingham, Nokia, and Lyon demonstrated how city-level innovative partnerships can drive the transition towards sustainable production and consumption. Birmingham's industrial symbiosis approach, part of its overall sustainable economic development strategy, promotes the use of waste materials and by-products as inputs in production in other parts of the economy. Lyon's "Chemistry Valley" has emerged around a diversified and integrated multi-site activity in chemistry, energy, and the environment (UNECE, 2018).

Green PPPs aim to provide public service delivery and, while they seek to benefit from mutually beneficial partnerships, they remain founded on public oversight. They, therefore, provide frameworks to ensure public leadership and accountability in tackling climate change, as well, while enabling the ownership of certain components of climate finance to be transferred to private hands. PPPs in climate finance can be understood as an interaction between public and private financial institutions for the delivery of climate finance (Gardiner, et.al., 2015, p.11).

The potential field of application of PPPs in climate finance is very broad. A recent report on Green Growth Best Practices (GGBP, 2014) points out the thematic areas that are identified for public-private collaboration. They include mostly the green infrastructure, where the PPPs hold the potential for enhancing the

efficiency of large infrastructure investments, mobilizing the resources needed to support infrastructure projects of a smaller scale, and supporting innovation as well as the emergence of new growth areas. Another field is natural resource management, where the importance of shared public and private ownership of natural resources to ensure shared valuation and awareness can help achieve effective compliance and enforcement.

PPPs are usually based on project finance using debt, equity and sometimes mezzanine capital. Innovative solutions refer to developing new financial instruments and institutions such as green bonds, green funds, and green banks, as well. According to the Climate Policy Initiative, private sector investment has taken the largest share in climate finance over recent years and project developers have consistently been driving the largest volume of private finance (Dharish & Anbumozhi, 2018, p.6). While the share of more traditional lenders in the green climate financing mix signals a maturing technology market, more commercial financial institutions are taking a larger role, with institutional investment growing rapidly. The general trend suggests the need for dedicated green finance institutions to leverage private finance that can help close the funding gap for many low-carbon investments, especially in developing countries. With the private sector alone being unable to mitigate externalities and monetize, many green investments through PPPs often require the support of Green Investment Banks (GIBs). Hybrid financing schemes are increasingly common as projects become more complex and are not viable purely based on private financing structures. Green technologies must develop an equitable risk allocation framework that can provide a compelling argument for different stakeholders to support these investments through subsidized financing to the extent that this financing is justifiable from a public good perspective. GIBs and similar entities have been established at the national level (Australia, Japan, Malaysia, Switzerland, the UK), state level (California, Connecticut, Hawaii, New Jersey, New York, and Rhode Island in the US), county level (Montgomery County and Maryland in the US), and city level (Masdar in the United Arab Emirates) (Dharish & Anbumozhi, 2018, p.5).

As many countries turn to debt to help their green recoveries from the coronavirus pandemic in 2020, an increasing number of governments and companies are looking at sustainability-focused financial instruments to fund major projects (Vassileva, et.al., 2020, p.594). Moreover, the development of financial instruments such as green bonds can be linked to PPP projects that can attract institutional investments (Vassileva, 2022, p.141). PPPs implementing innovative technologies with unproven environmental performance and uncertain financial returns have been struggling to find debt financing. Some innovative initiatives have been fostering the development of a deep green bond market. For instance, The Climate Bonds Initiative introduced international standards serving as a baseline to recognize and label green infrastructure projects. The methodology is built on clearly defined solar, wind, green building, and transport thresholds. It also establishes methodologies for efficiently measuring the results achieved from their implementation. Once a project has been certified as green, the bonds can receive the "green" label. These types of bonds are no different from any other regular project bond, sharing the same financial features but lacking the liquidity and benchmarks other, more mainstream, fixed-income instruments enjoy in capital markets (Ordonez, et.al., 2015, p.2).

JOWETT 2022, 2(05), 22;
https://doi.org/10.52459/jowett25221122

3. PPPs IN THE GLOBAL SUSTAINABLE DEVELOPMENT AGENDA

The roots of PPPs go back centuries ago, but their incorporation into the global sustainable development agenda has become more visible since the beginning of the millennium, when the OECD organized an expert meeting in Paris in February 2012 to discuss the potential of private investments in low-carbon, climate-resilient (LCCR) infrastructure. The investments they envisioned are aimed at new and existing public infrastructures in the field of transportation, energy, water management, public buildings, or urban development, in order to increase their contribution to sustainability, more specifically to the reduction of the emissions of greenhouse gasses and to the adaptation to climate change (OECD, 2012). Investments in infrastructures were considered a smart way to create a long-term and large-scale lock-in in LCCR-friendly technologies, thus realizing a substantive improvement in the sustainable performance of urban and societal systems. One of the options explored was the potential of public-private partnerships (Koppenjan, 2015, pp.1-3).

On September 25, 2015, more than 150 world leaders gathered at the United Nations headquarters in New York to formally endorse a new global agenda for the next 15 years. The 2030 Agenda for Sustainable Development, which includes the Sustainable Development Goals (SDGs), which is the result of an exhaustive consultation process lays out a vision of the future, in which poverty and hunger are eliminated, gender equity and quality education are achieved, and the effects of climate change are contained. The SDGs are a set of 17 goals, including 169 targets which represent an ambition, a target, and a measure for countries regarding sustainable development and a sustainable future. The SDGs build on the Millennium Development Goals (MDGs) and aim to complete what these MDGs did not achieve. Both are a natural evolution of the same idea, but the SDGs go much further. They expand the scope of the development agenda to include goals on economic growth, climate change, sustainable consumption, innovation, and the importance of peace and justice for all (UNDP, 2017). At their core, however, both the MDGs and the SDGs are the same: a belief that humanity - with sufficient determination and investment - has the ability to achieve sustainable development. A crucial difference between the MDGs and the SDGs is that the former were mainly targeted at governments while the latter targeted many different stakeholders including the private sector. Indeed, a shift in approach between the MDGs and the SDGs is the recognition that policy objectives are best achieved by involving and integrating private actors in the policy process (Marx, 2019, pp.1-2).

Since the 17 Sustainable Development Goals chart a transformative course toward a more prosperous, equitable and environmentally and economically sound world, aligning operations with the SDGs can position businesses ahead of market trends. The Business and Sustainable Development Commission reported in Better Business, Better World that the SDGs hold USD 12 trillion worth of business opportunities, ranging from affordable urban housing to agricultural technology advances (NASEM, 2017).

The latest research from the New Climate Economy finds that climate action and green growth could deliver at least USD 26 trillion in economic benefit through 2030 compared with business-as-usual, including the creation of over 65 million new low-carbon jobs, the avoidance of over 700,000 premature deaths from air

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pollution and the generation of an estimated USD 2.8 trillion in government revenues through subsidy reform and carbon pricing (NASEM, 2017).

A UN survey (UN, 2016) shows that half of the business community believes achieving Global Goals is a government responsibility. While governments have a role to play, neither they nor businesses can go it alone if the SDGs' ambitious targets are to be met.

Delivery of public infrastructure and services is an important way through which countries all over the world can work toward achieving their SDGs. Most countries in the different regions, in line with similar global trends, are striving to involve the private sector in the provision of needed infrastructure and services. In this context, public-private partnerships have become a dominant model. SDG 17 states it explicitly: "These inclusive partnerships built upon principles and values, a shared vision and shared goals that place people and the planet at the centre, are needed at the global, regional, national and local level" (NASEM, 2017).

While businesses across the world have invested extensively in this direction, the United Nations Economic Commission for Europe (UNECE) is advocating for "People First" Public-Private Partnerships, exploring new ideas and arrangements to increase access to essential services, lessen social inequalities and preserve the environment while transforming the economy. UNECE supports economies in transition in their efforts to design and implement such policies through policy analysis, recommendations, regional policy dialogue and capacity building. Furthermore, UNECE undertakes fundraising efforts for the launch of a capacity-building initiative on PPPs to support UNECE member States participating in the Belt and Road initiative in 2018–2019 (UNECE, 2018).

Active participants in the transition from a linear, resource-intensive system to a fully circular economy are the countries in Asia and the Pacific, as well (UN, 2016). Cities and regions provide venues for experimenting with different partnerships and solutions and have the flexibility and scope for policy experimentation. Their high business and consumer density, their universities and research institutes and their connectivity, make them ideal locations for innovation hubs, incubator spaces and urban farming.

4. GREEN PPPs IN THE EU POLICY

PPPs are at the heart of economic development and competitive initiatives in the EU as well, as they are expected to foster innovation, reconcile different interests and enable public authorities to come together around common goals. The European Union has a key role in bringing about sustainable development, within Europe and on the wider global stage, where widespread international action is required. The European Council set a strategic goal for the EU in Lisbon: "to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" (EC, 2001, p.2). The Stockholm European Council decided that the EU sustainable development strategy should

JOWETT 2022, 2(05), 22;
https://doi.org/10.52459/jowett25221122

complete and build on this political commitment by including an environmental dimension. This recognizes that in the long term, economic growth, social cohesion, and environmental protection must go hand in hand. Sustainable development offers the European Union a positive long-term vision of a society that is more prosperous and juster, and which promises a cleaner, safer, healthier environment – a society which delivers a better quality of life for us, for our children, and our grandchildren (EC, 2001, p.2). Achieving this in practice requires that economic growth supports social progress and respects the environment, that social policy underpins economic performance, and that environmental policy is cost-effective.

The EU Sustainable Development Strategy makes no reference to PPPs but does draw attention to the issue of green public procurement (EC, 2016, p.4). “In relation to public procurement, the legislative framework should facilitate the taking into account of environmental concerns alongside its primary economic purpose” (EC, 2001). It suggests that Member States should “consider how to make better use of public procurement to favour environmentally-friendly products and services” (Ryan, 2004, p.9).

In many cases, the EU gives priority to projects that include PPPs, for example in the construction of industrial zones, photovoltaic parks, high-tech centres, and others. With the major steps the EU is making on climate action there is much interest in how other financial instruments can push the achievement of the Paris Agreement on Climate Change objectives. It is no wonder that the experts from the World Bank consider that “decades of global PPP thinking can be an excellent starting point” (Loschacoff, 2020).

In 2015, the European Commission adopted an action plan to accelerate Europe's transition to a circular economy, strengthen global competitiveness, promote sustainable economic growth, and create new jobs. The action plan contains 54 measures to "close the cycle" of the product life cycle - from production and consumption to waste management and the market for secondary raw materials. The plan also identifies five priority sectors to accelerate the transition along the value chain (plastics, food waste, critical raw materials, construction and demolition, biomass, and bio-based materials). It emphasizes building a solid foundation for investment and innovation to thrive. The action plan encourages close cooperation with Member States, regions and municipalities, businesses, research organizations, citizens and other stakeholders involved in the circular economy. Finland, for example, is one of the pioneers of innovative partnerships for a circular economy and has adopted an ambitious national roadmap.

A circular economy is one that designs most pollution and wastes out of the system, extracts maximum value from resources and allows natural capital to regenerate. Innovation and partnerships, including Public-Private Partnerships (PPPs), are instrumental in making consumption and production more sustainable. There are numerous examples of new technologies, processes, services, and business models that are reshaping product life cycles from design through production and usage to disposal and recycling.

The European Green Deal, announced by the European Commission in December 2019, commits the EU to become climate-neutral by 2050 whilst promising to help companies to become world leaders in clean

products and green technologies. The ambitious and wide-ranging measures set out in the plan are aimed at achieving significant reductions in carbon emissions and a net zero target will be given legislative force in a new Climate Law. The measures are expected to require an investment of around €1trillion, to be funded under a new Sustainable Europe Investment Plan which will draw in part from the EU Budget, from the InvestEU Fund and from the European Investment Bank as well as private investment.

5. BEST PRACTICES OF DIFFERENT TYPES OF GREEN PPPs

***Case study 1**: The Tokyo Waste to Power PPP Model, Japan*

Green PPPs are quite popular in Japan. The government stimulates cooperation between the public and the private sector in different ways. Japan puts a higher priority on using resources efficiently and recycling materials to reduce its dependence on imports. The principle of circular economy in the country is defined by the Basic Law for Establishing the Recycling-based Society (2000). Japan's municipalities are responsible for providing services following national laws and developing necessary laws for implementation helping in this way manufacturers, sellers, and consumers.

This combination of technology, service provision system, and local community involvement is called the 'Tokyo Model' and is presented very well in a study written by Hongo (2016, pp.20-22). Turning waste into power, particularly municipal waste, has become very common in Japan. Its good practice has been adopted by many countries in Asia, South America and the Middle East (UN, 2016, p.43). Since 2011, Japan has adopted the feed-in-tariff (FiT) program and offered premium prices on electricity from renewable wastes.

More than 300 waste incineration plants generate electricity with a total capacity of 1700 Mh or almost equivalent to the generating capacity of 17 units of a nuclear power station. In the case of Tokyo's 23 cities, the calorific value of municipal waste with 40 per cent moisture content is around 2,200 kcal/kg. In general, lignite coal with 30 per cent moisture content has a calorific value of 4,500–5,500K cl/kg, while peat with 50 per cent or more moisture content has 2,300 Kcl/kg or more. At present, incineration technology uses waste with calorific values of 1,700–3,400 Kcl/kg for power generation without additional fuel. In addition to technology, waste-to-power generation requires a proper management system and well-trained operators as the property of waste varies day by day.

Various substances are found in the garbage. Without appropriate pollution control devices, pollutants such as particulates, dioxins, and heavy metals are likely to be emitted into the atmosphere by incineration. Also, public acceptance is crucial, and Japan's municipalities require lower toxic elements emissions than that regulated by a national standard.

Garbage separation at the collection system is an essential condition for efficient and safe waste incineration. Waste classification varies by municipality, but most are categorized as burnable, unburnable,

JOWETT 2022, 2(05), 22;
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paper, plastics, bottles, cans for recycling, and hazardous waste. Incineration plants are obliged to stop operation, clean up, and replace filters once toxic materials, like mercury, are found in emission control devices. Such incidents are caused by improper separation, such as when a significant number of fluorescent lamps, for instance, is mixed in the waste. Clean-ups and changes of filters are very expensive (¥280 million at an event in June 2010, not a negligible amount considering that the annual electricity sale is around ¥5,000 million).

Tokyo provides information on waste separation through various channels, including education programs at schools. Although technology reduces the risk of pollution, unexpected things could still happen. Thus, dialogue with local people is very important in improving mutual understanding.

***Case study 2**: Green Energy Project in Serbia: The First Solar Power Plant in Kladovo*

Serbia, with a population of around 7.1 million, satisfies most of its electricity demand from domestic production. Electricity production in Serbia relies around 70 per cent on coal, while the remaining 30 per cent is generated in hydropower plants. The electricity market in Serbia is dominated by the national power utility EPS (Elektroprivreda Srbije – Power Industry of Serbia), which owns all large generation capacities and supplies most consumers.

According to the Serbian national energy balance for 2020 the electricity generation in 2019 in GWh is as follows: coal -26,295 GWh, district heating – 346 GWh, hydropower - 10,172 GWh, gas cogeneration – 108 GWh, wind - 848 GWh, solar 14 GWh, biogas - 116 GWh, industrial generation - 363 GWh, other sources - 587 GWh, quoted by Bankwatch (2020).

With its traditional forms of generation not proving resilient to climate change, Serbia is trying to diversify its energy mix and work more on energy efficiency. The country has promising potential for renewable energy and has a target to increase energy efficiency by 20 per cent by 2020 under the Energy Community Treaty.

Apart from using hydropower, where Serbia has a long history of success, the country turns to other natural sources of energy such as wind and sunlight. The number of hours of solar radiation in the territory of Serbia is between 1,500 and 2,200 hours per year. The average intensity of solar radiation is from 1.1 kWh / m2 / day in the north to 1.7 kWh / m2 / day in the south – in January, and from 5.9 to 6.6 kWh / m2 / day – in July. The average quantity of energy radiation is 1,200 kWh / m2 / year in northwest Serbia, up to 1,550 kWh / m2 / year in southeastern Serbia, while in the central part it is around 1,400 kWh / m2 / year (MT-KOMEX, 2021). Serbia has a significantly higher number of hours of solar radiation than most European countries, and the best conditions are in the southeastern part of the country.

Green projects in cooperation with local municipalities turn out to be very popular in building photovoltaic parks. The first and the biggest privately owned solar power plant in Serbia was built in the village of Velesnica, in the municipality of Kladovo. The private investment amounts to Euro 3 million financed by several foreign banks. The entire engineering and design were done by the Center for Energy Efficiency and

Sustainable Development (CEEFOR) from Belgrade, while the project manager was the Slovenian company "Enertec Ltd" from Maribor. During the construction of the power plant, local companies and the local labour force were engaged, in order to contribute to the development of the local community. The solar power plant has been producing green energy since 2013 for the national electricity distribution system. It is spread over 4,5 acres of land, and the total area of solar panels is 13,600 square meters. Photovoltaic polycrystalline panels and string inverters are used to convert the direct current generated in the solar panels into alternating current. Investors can monitor energy production every day using a remote monitoring system. The solar park in Velesnica has 8,462 photovoltaic polycrystalline panels with individual power of 245 watts with a total generation of power of 2,000 kW which represents the biggest capacity in Serbia at present. Carbon dioxide reduction is 2,324 t/year.

With regard to the extremely favourable position - proximity to rivers, specific rose of winds and a large number of sunny days throughout the year, new plans have been made for the expansion of environmentally friendly facilities. This is in line with the EU policy since Serbia intends to join the EU in 2025. Together with the several newly built wind plants, it should also be aiming for 80-95 per cent emissions reductions by 2050 (Solarisenergy, 2021). They may apply PPPs or some other forms of cooperation in a broader sense.

***Case study 3**: "P4G"—Partnering for Green Growth and the Global Goals 2030*

An excellent example of uniting international efforts in accelerating PPPs with promising solutions for sustainable development and growth is the initiative "P4G"—Partnering for Green Growth and the Global Goals 2030 established in 2018. It is the world's leading forum for developing concrete public-private partnerships at scale to deliver inclusive growth and implement the Sustainable Development Goals (SDGs) and the Paris Agreement on Climate Change. "P4G" works in collaboration with nine partner countries, four key organizational partners and support from leading organizations in the private sector and civil society to identify and incubate innovative partnerships for sustainable development and growth. P4G partnerships include both private- and public-sector actors who are working together to advance not only innovative but also commercially viable projects in at least one of the five SDG sectors' P4G targets. Its most urgent challenges (P4G, 2018, p.4) facing the PPPs are:

- How to provide adequate food and water to an ever-increasing global population?
- How to bring power to some 1 billion people who lack access to electricity?
- How to act now to avoid the most damaging impacts of climate change?
- How to provide clean air, efficient transportation and efficient services to the billions of people who live in large cities?
- How to transform the way the products are made, used, and recycled to minimize waste and maximize life-cycle value?

JOWETT 2022, 2(05), 22;
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The innovative platform "P4G" recommends the PPP projects to be implemented as per the following goals:

Food and agriculture SDG 2: This goal includes technology in large-scale and smallholder farms, sustainable and local food production and food loss and waste reduction.

Water SDG 6: Another important area is micro-irrigation, technology, and incentives for reducing municipal water leakage as well as water and sanitation infrastructure.

Energy SDG 7: A key priority which covers the expansion of renewable energy demand and supply, new models for financing and supplying electricity to underserved regions as well as grid interconnection.

Cities SDG 11: Improving urban life pursues energy-efficient buildings, electric buses for cleaner air and green supply chains and logistics.

Circular Economy SDG 12: This goal implies reducing packaging waste, new plastics economy, sustainable special economic zones and circular models for manufacturing and reuse of waste materials (P4G, 2018, p.7).

A study accomplished by Choi, et.al. (2020) examines the PPP network by visualizing the relationship among stakeholders through social network analysis (pp.1-2). Considering the case of the Partnership for Green Growth and Global Goals 2030 (P4G), this study investigates the actors and the relationship between the actors by stage and year. The authors find out that over 50 PPP projects in developing countries have been financially supported. Considering the partnerships of P4G they make use of the opportunity to examine how PPPs evolve by stage and year, which could help the future implementation of PPP in the recommended areas. By visualization of the network of PPPs in "P4G" the study reveals that the partnerships have been evolving since the participants' relationships become stronger each year. Moreover, the role of each actor becomes clearer at each stage. The authors provide practical guidance for practitioners interested in promoting international development cooperation through PPPs in the future. This study gives scope for implications regarding the promotion of PPP in collaborative international business. First, it visualizes the evolution of PPPs via a case study of P4G, which is emerging as a promising cooperation platform to achieve SDGs. Second, from the results of network analysis, the researchers define the role of each stakeholder in the international cooperation business. Finally, future studies can consider respective stakeholders by comparing the network of R&D and demonstrative projects, represented by the P4G start-up and scale-up stages, respectively (p.10).

6. CONCLUSION

Following the ratification of the Paris agreement, highly developed, less developed and emerging economies are taking actions that help accelerate investments in green infrastructure and better social conditions. While PPPs differ in name, scope, and approach, they share the following core characteristics: a mandate

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focusing mainly on mobilizing private investment using interventions to mitigate risks and enable transactions, innovative transaction structures and market expertise, independent authority, a focus on cost-effectiveness and public-private win-win (Hongo, 2020, p.20). Green PPPs are a promising alternative that may offer both practical and conceptual solutions to ensure the productive interaction of public and private organisations. Green PPPs change their dimensions as good practices show that they exceed the conventional cooperation between public and private partners adopting new forms like green funds, green platforms, innovative funding tools and partners like green bonds, green banks, etc.

The greening of industries and green PPPs have been proclaimed as a global imperative and have become a core determinant of economic competitiveness and sustainable growth. Since resource inputs represent an important production cost for industries, improving efficiency gives industries a competitive advantage. The greening of industries also plays a role in poverty alleviation, by promoting energy security, health and safety, jobs, and reducing costs through increased productivity. The decisions have been made, now it is time to solve the problem of the inconsistent delivery of sustainability.

On a European level, the situation is a little bit different. The biggest driving force in including sustainability criteria in PPPs is public procurement or PPP rules, laws or interpretive communications as well as the new EU SEA Directive. Even though the will is there to promote sustainability through procurement (EC, 2016), EC guidance on incorporating green and social considerations has an insignificant effect, and in most cases, is unknown by procuring authorities. The UK and some Scandinavian countries are an exception taking into consideration the fact that generally speaking the UK has huge experience in all types of PPP/PFI projects. In the UK example, guidance exists on incorporating green issues in PPPs since 2002. Incorporating green principles into PPPs on a European level is not very efficient regardless of its sustainability strategy. This issue also refers to the national level.

Koppenjan (2015) in his analysis of the public-private partnerships for green infrastructures identifies six challenges that might be perceived as tensions in realizing green PPPs. One may dispute his point of view but some of his arguments are quite convincing, especially the contradiction of profitability and economic regulation versus sustainability and the government-business interface versus stakeholder involvement. „Since stakeholders are not necessarily committed to LCCR policies, stakeholder management should be aimed at aligning private, public and stakeholders interests with each other and with LCCR objectives. Private investments in LCCR infrastructure requires stakeholder participation, perhaps even to an extent that PPPs turn into Public Private Community Partnerships“ (p.5). It proves once again that the efforts of public and private entities are not sufficient, NGOs and society should participate actively in changing the new function of the governments, whose role is like a mere partner needs to be reconsidered.

Achieving sustainable development requires not only attracting private finance to develop infrastructure, create a clean environment, build green urban areas, to provide quality education and healthcare, but also ensuring better access to services that put people and the planet first. Thus, the private sector's role should not

only be to provide financial resources but also to contribute towards improving the quality of life and reaching better living standards.

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