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Criteria of infrastructure enterprises' sustainable development for meeting the sustainable development goals

Abstract
The article reviews the strategies of cross-sectoral investments in infrastructure in the energy, water supply, sewage and solid waste sectors in order to achieve the Sustainable Development Goals (SDGs), as one of the important conditions for achieving the SDGs at the state level. If we take into account the growing demand for infrastructure services in these four sectors, it can be concluded that the implementation of the SDGs enables the achievement of 19 goals directly related to infrastructure. The concept of sustainable development goals (SDGs) is considered in view of the development of infrastructure in the world. The study showed that building an infrastructure development strategy should be based from the very beginning on an understanding of sustainability, conservation of natural resources, provision of ecosystem services, maximization of local benefits in terms of infrastructure services or job creation. On a global scale, almost all countries have committed to complying with the Sustainable Development Goals (SDGs), and due to insufficient planning, inadequate consultations and a low level of transparency, there are delays in the implementation of infrastructure projects, overspends, etc. Building an infrastructure development strategy should be based on an understanding of sustainability from the very beginning, in other words, building infrastructure at the local or regional level should be aligned with the SDGs. The main attention is paid to the issue of defining the definition of "sustainable infrastructure", which is built on ensuring economic, financial, social, environmental (including climate change resistance) and institutional sustainability throughout the entire life cycle of the project, taking into account the requirements of the Sustainable Development Goals. Institutionally sustainable infrastructure is aligned with national and international commitments, including the Paris Agreement, and is based on transparent and consistent management systems throughout the project cycle. Sustainable infrastructure must develop technical and engineering capabilities, as well as systems for data collection, monitoring and evaluation to generate empirical evidence and quantify impacts or benefits. The subject of the study is the conceptual, theoretical, methodological and applied approaches for developing strategies of cross-sectoral investments in infrastructure in the energy, water supply, sewage and solid waste sectors in order to achieve the Sustainable Development Goals (SDGs). Methodology. General scientific methods were used in the research process. The method of comparison was used for generalizing the approaches of different researchers on the main dominants of development strategies of cross-sectoral investments in infrastructure. Analysis was used to determine the quantitative and qualitative criteria of the different approaches to sustainability, sustainability assessment and environmental, social and governance (ESG) standards.

Keywords
Sustainable development goals, sustainable infrastructure, economic sustainability, financial sustainability, social sustainability, environmental (including climate change resilience) sustainability, institutional sustainability

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1 Introduction

At a time of increasing global investment in infrastructure, there is a need to support investors in making informed choices to make progress towards the Sustainable Development Goals.

The concept of sustainable development, which was formed in the process of combining three main approaches: economic, social and ecological, involves taking measures aimed at the optimal use of limited resources and the application of ecological, energy-saving and material-saving technologies, ensuring the integrity of natural systems. One of the important conditions for achieving the Sustainable Development Goals at the state level is their implementation through the adoption of cross-sectoral infrastructure investment strategies in the energy, water supply, drainage, and solid waste sectors. If we bear in mind

the growing demand for infrastructure services in these four sectors, it can be concluded that the implementation of the SDGs enables the achievement of 19 goals directly related to infrastructure.

Ukrainian scientists pay considerable attention to various aspects of the introduction of the principles of sustainable development on a national and global scale. In particular, T. S. Yefimenko, L. G. Lovinska, T. A. Cooper, I. B. Oliynyk, Y. I. Korneeva, S. V. Petrukha, B. V. Stakhova, M. I. Stegnei, and other authors.

Numerous studies by foreign authors are devoted to the problems of building sustainable infrastructure, in particular: Atkins G., Davies N., Bishop T. K., Bhattacharya A., Oppenheim J., Stern N., Fuldauer L. L., Adshead D., Thacker S., Hickford A. J., Hall J. W., Thacker S., Ives M. C., Cao Y., Chaudry M., Blainey S. P., Oughton E. J., Hickford A. J., Nicholls R. J., Otto A., Hall J. W., Blainey S. P., Tran M., Baruah P., and many others.

The aim of the article is to review infrastructure development strategies in the context of achieving sustainable development goals, preserving natural resources, providing ecosystem services, maximizing local benefits in terms of infrastructure services or creating jobs, defining the term of "sustainable infrastructure", delivering Sustainable Infrastructure.

2 Sustainable infrastructure complying with the Sustainable Development Goals

The Sustainable Development Goals (SDGs) were developed as key directions for the development of countries, adopted at the UN Summit on Sustainable Development, which continued the Millennium Development Goals (UNDP). An action plan aimed at bringing the world to a new trajectory of progress was announced in the Resolution of the UN General Assembly "Transforming our world: Agenda for sustainable development for the period until 2030", adopted on September 25, 2015. (United Nations).

The SDGs are designed for the period from 2015 to 2030. and include 17 Global Goals, which contain 169 tasks. They cover a wide range of responses to challenges that remain relevant in the era of globalization: overcoming poverty; overcoming hunger; good health and well-being; quality education; gender equality; clean water and proper sanitary conditions; affordable and clean energy; economic growth and decent work; industry, innovation and infrastructure; reducing inequality; sustainable development of cities and communities; responsible consumption and production; fight against climate change; conservation of oceans, seas and marine resources; protection and restoration of terrestrial ecosystems; open society and strong institutions; partnership for sustainable development (United Nations).

Ukraine has joined the global process of ensuring sustainable development. To outline the strategic framework of the country's progress for the period until 2030. steps were taken to ensure the process of adaptation of the Central Bank. Each global goal was considered taking into account national specifics. A number of nationwide and regional consultations took place, the result of which was the determination of national SDGs as a basis for integrating efforts aimed at ensuring economic growth, social justice and rational environmental management (Ministry of Economic Development and Trade of Ukraine).

One of the important conditions for achieving the SDGs at the state level is their implementation through the adoption of cross-sectoral infrastructure investment strategies in the energy, water supply, drainage and solid waste sectors. If we take into account the growing demand for infrastructure services in these four sectors, it can be concluded that the implementation of the SDGs enables the achievement of 19 goals directly related to infrastructure.

Over the next decade, about $90 trillion will need to be spent on sustainable infrastructure assets worldwide (Bhattacharya, Oppenheim, Stern, 2015). As the demand for infrastructure services increases under the pressure of demographic trends, urbanization, economic growth and climate change, infrastructure systems must evolve and adapt to meet these needs efficiently, effectively and with the concept of sustainable development in mind. The concept of sustainability is usually considered and evaluated in terms of trade-offs between a set of main factors, which include: economic (obtaining a net positive economic profit); social (promoting the increase of social well-being); and environmental (preservation, restoration and integration of the natural environment while ensuring resilience to climate risks) (Inter-American Development Bank, 2018).

Let's consider in more detail the concept of the Central Bank in view of the development of infrastructure in the world.

Infrastructure services such as the supply of drinking water and electricity, wastewater disposal and treatment, the mobility of people and goods, and the provision of information and communication technologies are the basis for economic development, competitiveness, and inclusive growth. Infrastructure investment needs in different regions are estimated at 3-8% of gross domestic product (GDP), but investments range from 2% to 3% of GDP (Serebrisky, 2014).

Closing the infrastructure gap requires both additional spending on roads, power plants, and sewage systems, as well as other spending on transforming the way infrastructure is planned, developed, and operated. The infrastructure being built now will determine our climate future. According to estimates, 60% of carbon emissions worldwide are caused by the construction and operation of existing infrastructure (Mü ller, Daniel B., Gang Liu, 2013).

The creation of infrastructure facilities in some regions, such as Latin America or the Caribbean, is

becoming an increasingly complex process due to climate change, environmental and social issues. At the same time, innovative technologies will change the way infrastructure is designed, built and financed. Innovative technologies and business models, combined with demographic and demand changes, can render certain types of infrastructure obsolete. The need to attract new sources of private financing amplifies the legal and regulatory challenges facing public institutions seeking to increase investment in sustainable infrastructure. The effects of climate change or physical climate risks are of increasing concern, reducing the predictability of future infrastructure needs as well as increasing the vulnerability of assets.

On a global scale, almost all countries have committed to complying with the Sustainable Development Goals (SDGs), and due to insufficient planning, inadequate consultations and a low level of transparency, there are delays in the implementation of infrastructure projects, overspends, etc.

In our point of view, building an infrastructure development strategy should be based on the very beginning on an understanding of sustainability, conservation of natural resources, provision of ecosystem services, maximization of local benefits in terms of infrastructure services or job creation. In other words, we are sure that the construction of infrastructure at the local or regional level must be coordinated with the Central Bank.

The next issue is the definition of "sustainable infrastructure". The Global Commission on the Economy and Climate (Global Commission on the Economy and Climate) noted that infrastructure is: "Structures and objects that underlie energy and other energy systems (including fuel production infrastructure), transport, telecommunications, water supply and management waste It includes investments in systems that improve resource efficiency and demand management, such as energy and water efficiency measures. Infrastructure includes both traditional types of infrastructure (including energy for public transport, buildings, water supply and sanitation) and, importantly, natural infrastructure (such as forest landscapes, wetlands, and watershed protection)" (Bhattacharya, Oppenheim, Stern, 2015).

Thirty years ago, the World Commission on Environment and Development defined sustainable development as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Combining these concepts provides a starting point for defining sustainable infrastructure, and the following high-level frameworks for sustainability and sustainable infrastructure provide further guidance:

The concept of sustainable development of the UN Commission on Sustainable Development in 2001 includes the following indicators (Wu, Jianguo, and Tong, Wu., 2012):

Social – justicee, health care, education, housing, security, population;

Ecological – atmosphere, earth; oceans, seas and coasts, biodiversity;

Economic – economic structure, consumption and production;

Institutional – conceptual framework and capabilities;

The Wuppertal framework of sustainable development indicators includes indicators covering environmental, social, economic and institutional aspects [13].

Economic and financial sustainability, social sustainability and environmental sustainability are included in the Action Plan for sustainable infrastructure of the World Bank – they are defined as key elements of sustainable infrastructure, which is the basis of good governance (World Bank Group, 2008).

The G7 Ise-Shima Principles for Promoting Quality Infrastructure Investment (2016) identify five principles that cover governance, efficiency, sustainability, job creation, capacity building, social and environmental impacts, coordination with economic and development strategies and effective mobilization of resources.

Allow for the above, it is possible to provide the following definition of the definition of "sustainable infrastructure":

"Sustainable infrastructure refers to infrastructure projects that are planned, designed, built, operated and decommissioned in such a way as to ensure economic, financial, social, environmental (including climate change resilience) and institutional sustainability throughout the life cycle of the project, taking into account the requirements Goals of sustainable development".

3 How to create the sustainable infrastructure?

Based on the framework, we have identified 66 criteria which are relatively easy to define because of the consistency between different approaches to sustainability, sustainability assessment and environmental, social and governance (ESG) standards (Danny Zhao-Xiang Huang, 2021).

Let's take a closer look at different types of infrastructure sustainability.

Economic and financial stability.

Infrastructure is economically sustainable if it generates a positive net economic return, consider all benefits and costs during the life cycle of the project, including positive and negative externalities and secondary effects. In addition, the infrastructure must generate an adequate rate of return considering the risk for the project's investors. Therefore, sustainable infrastructure projects should generate a reliable

revenue stream based on adequate cost recovery and be supported, if necessary, by targeted subsidies (to ensure accessibility) or accessibility payments (if users cannot be identified) or if there are significant side effects. Sustainable infrastructure must be developed to support inclusive and sustainable growth, improve productivity, and provide high-quality and affordable services. Risks must be fairly and transparently distributed among the entities most capable of controlling the risk or absorbing its impact on the investment results during the project's life cycle.

Criteria of Economic and Financial Sustainability

1. Economic and social returns

1.1. Project design for optimal economic growth.

1.2. Economic and social return over project life cycle.

1.3. Increase of local investment.

1.4. Service access and affordability.

1.5. Service efficiency, quality, and reliability.

1.6. Infrastructure asset maintenance and optimal use.

2. Financial Sustainability

2.1. Positive net present asset value.

2.2. Adequate risk-adjusted rate of return.

2.3. Clarity on revenue streams.

2.4. Operating profitability.

2.5. Asset profitability.

2.6. Debt and fiscal sustainability.

2.8. Liquidity ratios.

2.9. Solvency ratios.

3. Policy attributes

a. Efficient risk allocation.

b. 3.2. Commercial and regulatory incentives for sustainability.

Environmental sustainability, including resilience to climate change

Sustainable infrastructure conserves, restores and integrates the natural environment, including biodiversity and ecosystems. It supports the sustainable and efficient use of natural resources, including energy, water and materials. It also limits all types of lifecycle project pollution and promotes a low-carbon, sustainable and resource-efficient economy. Sustainable infrastructure projects are (or should be) positioned to ensure resilience to climate change and natural disaster risks. Infrastructure sustainability is often country-specific, where overall performance must be measured against what could be built or developed instead.

Criteria of environmental sustainability, including resilience to climate change

1. Climate and Natural disaster

1.1. Project design for low GHG emissions.

1.2. Assessment of climate risks and project-resilient design.

1.3. Project design and systems optimization for disaster risk management.

1.4. Durability, flexibility, and recovery of design elements and technological systems.

2. Pollution

2.1. Project design and systems optimization to minimize air pollutant emissions.

2.2. Project design and systems optimization to minimize water contamination.

2.3. Project design and systems optimization to minimize soil and other pollution.

3. Preservation of the Natural Environment

3.1. Environmental assessment of project impacts.

3.2. Project design for maximum ecological connectivity.

3.3. Preserve natural areas, areas with high ecological values, and farmlands.

3.4. Project design and technology to minimize invasive species.

3.5. Project design and technology to optimize soils management.

4. Efficient use of resources

4.1. Efficient use of water resources.

4.2. Material use and recycling.

4.3. Project design to minimize energy consumption and maximize use of renewable.

4.4. Waste management and recycling.

4.5. Hazardous materials.

Social sustainability

Sustainable infrastructure is inclusive and must have broad community support – it serves all stakeholders, including the poor, and improves livelihoods and social well-being throughout the project's life cycle. Projects must be built in accordance with labor, health and safety standards. Benefits derived from sustainable infrastructure services must be shared fairly and transparently. Services provided by such projects should promote gender equality, health, safety and diversity, while respecting human and labor rights. Forced relocation should be avoided as much as possible, and if it cannot be avoided, displacement should be minimized by exploring alternative projects. Where economic displacement and resettlement of people cannot be avoided, this should be done in a consultative, fair and equitable manner and should include the preservation of culture and heritage.

Criteria of Social sustainability

1. Poverty, social impact and Community engagement

1.1. Social impact assessment of project.

1.2. Social sustainability and development plan.

1.3. Stakeholder engagement process.

1.4. Community consultation and participation.

1.5. Project design for fair benefit sharing and compensation to project-affected communities.

1.6. Project design to minimize impacts of resettlement and economic displacement.

1.7. Provision of public amenities within project's area of influence.

1.8. Project design to maximize community mobility and connectivity.

2. Human and Labor rights

2.1. Universally accessible project design and technologies.

2.2. Community health, safety, and security, and crime prevention.

2.3. Occupational health, safety, and labor standards throughout the project.

2.4. Project design that preserves the rights of vulnerable groups.

2.5. Gender-inclusive project design.

3. Cultural preservation

3.1. Project design that does not limit communities' access to resources.

3.2. Cultural resources and heritage.

3.3. Indigenous and traditional peoples.

Institutional stability

Institutionally sustainable infrastructure is aligned with national and international commitments, including the Paris Agreement, and is based on transparent and consistent management systems throughout the project cycle. Strong institutional capacity and well-defined procedures for project planning, procurement and operation are factors in institutional sustainability. Building local capacity, including mechanisms for knowledge transfer, fostering innovative thinking and project management, is critical to enhancing resilience and promoting systemic change. Sustainable infrastructure must develop technical and engineering capabilities, as well as systems for data collection, monitoring and evaluation to generate empirical evidence and quantify impacts or benefits.

Criteria of Institutional stability

1. Global and national strategies

1.1. Project contribution to national and international commitments for sustainable development.

1.2. Project alignment with national and sectoral infrastructure plans.

1.3. Land use and urban planning integration.

2. Governance and systematic changes

2.1. Project alignment with economic, territorial, and urban strategies.

2.2. Project alignment with natural, environment, and social strategies.

2.3. Establishment of corporate governance structures.

2.4. Environmental management systems.

2.5. Social management systems and grievance redress mechanisms for external stakeholders and for workers, including contractors.

2.6. Project design and systems selection in alignment with certified providers.

2.7. Anti-corruption and transparency framework.

3. Management system and Accountability

3.1. Project design and systems for engineering and technological feasibility.

3.2. Project organization to ensure accountability, collaboration, and innovation.

3.3. Project design and planning to ensure optimal implementation.

3.4. Project information sustainability monitoring and tracking.

4. Capacity building

4.1. Project design and systems to promote institutional capacity building.

4.2. Local capacities and awareness.

4.3. Project design and engineering studies for sustainability performance.

4 Conclusion

The study showed that building an infrastructure development strategy should be based from the very beginning on an understanding of sustainability, conservation of natural resources, provision of ecosystem services, maximization of local benefits in terms of infrastructure services or job creation. In other words, we are sure that the construction of infrastructure at the local or regional level must be coordinated with the Central Bank. A review of existing concepts allowed us to provide our own definition of the definition of "sustainable infrastructure": "Sustainable infrastructure refers to infrastructure projects that are planned, designed, built, operated and decommissioned in such a way as to ensure economic, financial, social, environmental (including resilience to climate change) and institutional sustainability throughout the entire life cycle of the project, taking into account the requirements of the Sustainable Development Goals".

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