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# Internet Governance: System Imbalances and Ways to Resolve Them<sup>1, 2</sup>

S. Vasilkovsky, A. Ignatov

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## Abstract

*The spread of digital technologies has led to the global digitalization of all types of public activities. The digital economy emerging during this process has become a leading factor in world economic growth and one of the criteria of national development. The digital economy is based on the Internet, which ensures the functioning of new business models, forms of social interaction and public diplomacy. The Internet's governance system differs from other modern international systems of public and political relations in that the leading role in it is played by non-governmental organizations, in particular, the Internet Corporation for Assigned Names and Numbers (ICANN) and the Internet Society (ISOC). The activities of states are significantly limited by the basic properties of the system, which complicates the implementation of the state's digital sovereignty. The aim of this article is to determine ways to resolve this discrepancy.*

*Analyzing the current state of Internet governance, the authors outline the key characteristics that lead to potential conflict. These include decentralization, an insufficient evaluative level of accountability and lack of legitimacy. The authors analyze ICANN and ISOC toolkits and identify the key instruments that actually make organizations central to the Internet's governance system. In conclusion, the authors provide recommendations for action by the international community to mitigate the identified imbalances.*

**Key words:** digital technologies; digital economy; digital sovereignty; Internet; Internet governance; cyber power; ICANN; ISOC

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## Introduction

In recent decades, the quick spread of the digital economy and the Internet as its main component [Bukht, Heeks, 2018, pp. 148–51] has led to transformation of all aspects of social interactions. Developments in the sphere of Internet-based economic activities raised the profile of the Internet as a means of production in various economic spheres [see Kaila, Tarp, 2019;

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<sup>1</sup> The editorial board received the article in August 2020.

<sup>2</sup> The article was written on the basis of the RANEPa state assignment research programme.

Korchagin, Deniskina, Fateeva, 2019; Pozdnyakova et al., 2019; Shiroma et al., 2019; Zhang, Chen, 2019]. Growth in the traffic capacity of digital infrastructure<sup>3</sup> opened prospects for proliferation of digital trade: in 2017, the total amount of digitally delivered goods and services grew to \$29 trillion [UNCTAD, 2019, p. 15]. As a result, the digital economy, also known as the Internet economy, makes up 22% of the global economy, and this figure tends to grow [Bukht, Heeks, 2018, p. 158].

At the same time, the Internet is acknowledged to be a source of new security threats. The European Union's (EU) NIS Directive on the security of network and information systems across the Union is premised on the notion that the security of information networks, including the Internet, plays the fundamental role in transboundary movement of goods, services and people and thus is the pillar of sustained functioning of the internal market [EU, 2016, Para. 3].

The Internet is a competition ground for various parties and groups of interests. At the same time, states' decision-making capacities concerning the management of the Internet are quite limited despite the fact that they remain the main subjects of global policy by their nature [Haugen, 2020; Liaropoulos, 2013; Nye, 2014]. The Internet's governance system is characterized by a relatively low level of accountability for the main non-state actors and thus the system itself could be defined as non-legitimate [Haugen, 2020; Keohane, 2011]. Selected papers argue for the more active participation of states in Internet governance, for instance, in human rights-related matters [Zalnieriute, Milan, 2019].

Taking into account the conflictogenity of the Internet's governance system, it is not surprising that states argue for more delegated power in Internet-related matters. The goal of gaining more weight in Internet governance is embedded in Russia's doctrine of information security [President of Russia, 2016].

This article seeks ways to resolve the disproportions that are entrenched in the Internet's governance system. We start with an analysis of the basic characteristics of the system which predetermine the conflict between the limitations of state sovereignty and the low level of accountability for non-governmental parties. Next, we consider the main features of the main non-governmental parties in Internet governance – the Internet Corporation for Assigned Names and Numbers (ICANN) and the Internet Society (ISOC). We conclude with recommendations intended to iron out the constraints of the Internet's governance system.

## Basic Characteristics and the Role of States in Internet Governance

Internet governance is a complex process because 'the Internet is, by definition, a complex system that is not governed by some separate organization' [van Horenbeeck, 2018, p. 6]. A brief overview of the emergence and development of the Internet allows for the identification of the contradictions that characterize this system.

In the late 1960s the U.S. created the Advanced Research Project Agency Network (ARPANET) system, a prototype of the modern Internet. Despite the fact that systems like ARPANET were under development in several other countries, it was the American project that became the forerunner [Paloque-Berges, Schafer, 2019, p. 4].

The first ARPANET sponsor was the Defense Advanced Research Projects Agency. The system was created to provide access to remote computers throughout the United States. Within

<sup>3</sup> The Organisation for Economic Co-operation and Development (OECD) proposed one of the most prominent definitions of this notion: 'Digital infrastructures, including efficient, reliable and widely accessible broadband communication networks and services, data, software, and hardware, are the foundations on which the digital economy is based' [OECD, 2017, p. 28]. In the past decade the carrying capacity of transnational data networks has grown by 45 times [Nye, 2017], and the total number of devices based on the 'Internet of things' technology is expected to surpass 20 billion [Naughton, 2016].

the framework of ARPANET technologies were developed which subsequently determined the features of the modern Internet – in particular, data routing technology and the first version of the Internet protocol. In 1986, the former members of the ARPANET project created the Internet Engineering Task Force (IETF), the first open professional organization with a focus on networking. The ARPANET project was scrapped in 1990 due to the revision of the budgetary policy of the U.S. Department of Defense.

Since the 1990s, the number of Internet users has grown at a rapid pace, surpassing one billion in 2006 according to International Telecommunication Union (ITU) statistics. The determining factors for the spread of the Internet included falling prices for personal computers and the development of global infrastructure.

In the 2000s, the growing importance of the Internet made it urgent for the global community to find consensus on the basic characteristics of the global information network management system. The basic principles were enshrined in a declaration adopted during the World Summit on the Information Society in 2003–05. The declaration focused on ‘cooperation and partnerships between all stakeholders’ [UN, 2003, Para. 20], including governments, private companies, civil society, the United Nations (UN) and other international organizations. It also stated that ‘Internet governance encompasses both technical and public policy issues’ [UN, 2003, Para. 49]. The declaration assigned responsibilities to all parties involved in developing the technical and economic aspects of the Internet and clarified the role of states: ‘Political authority over Internet-related public policy issues is the sovereign right of states. States have rights and responsibilities regarding Internet-related public policy issues at the international level’ [UN, 2003, Para. 49 (a)].

The variety of actors participating in the regulation of the Internet determines the complexity of interactions between them and the impossibility of identifying a single centre in this system. Joseph S. Nye characterizes the Internet’s governance system as a complex regime, encompassing the interaction of the actors involved at the physical and informational levels. Internet governance is also a component of a more sophisticated cyberspace governance regime [Nye, 2014]. States ‘nesting among other subjects of <Internet> governance’ [Scholte, 2017, p. 166] operate mainly at the physical level, while private companies and international organizations mainly operate at the information level. It is from this level that the main threats emanate because the actions of attackers in the information space can cause disproportionately high damage at the physical level, ‘where resources are limited and have a high price’ [Nye, 2014, p. 5].

Cyberspace governance, as a new reality, presupposes the presence of fundamentally different instruments. With the integration of digital technologies into social and political realities, the role of cyber power is increasing and is no longer limited to states. The asymmetry generated by this phenomenon is leading to a redistribution of power in the international arena [Nye, 2010].

The monopoly of states on the possession and exercise of traditional power does not at all predetermine their leadership in cyberspace. The relatively low cost of entering the market, user anonymity, and asymmetry in vulnerabilities mean that new actors have more opportunities to use hard and soft power in cyberspace than in other areas of international politics. The main problem here is the disproportionate power of states due to their traditional role in international affairs and their limited ability to control cyberspace.

The high cost of state activity at the information level determines the dominance of non-state actors in it. Among other components, the addressing system and technical standards are important elements of the Internet’s management system. They are uniformly applied throughout the entire space of the global network and without them the existence of the Internet is impossible. The first element is under the authority of ICANN, and the second is within the responsibility of organizations administered by ISOC (see Fig. 1).

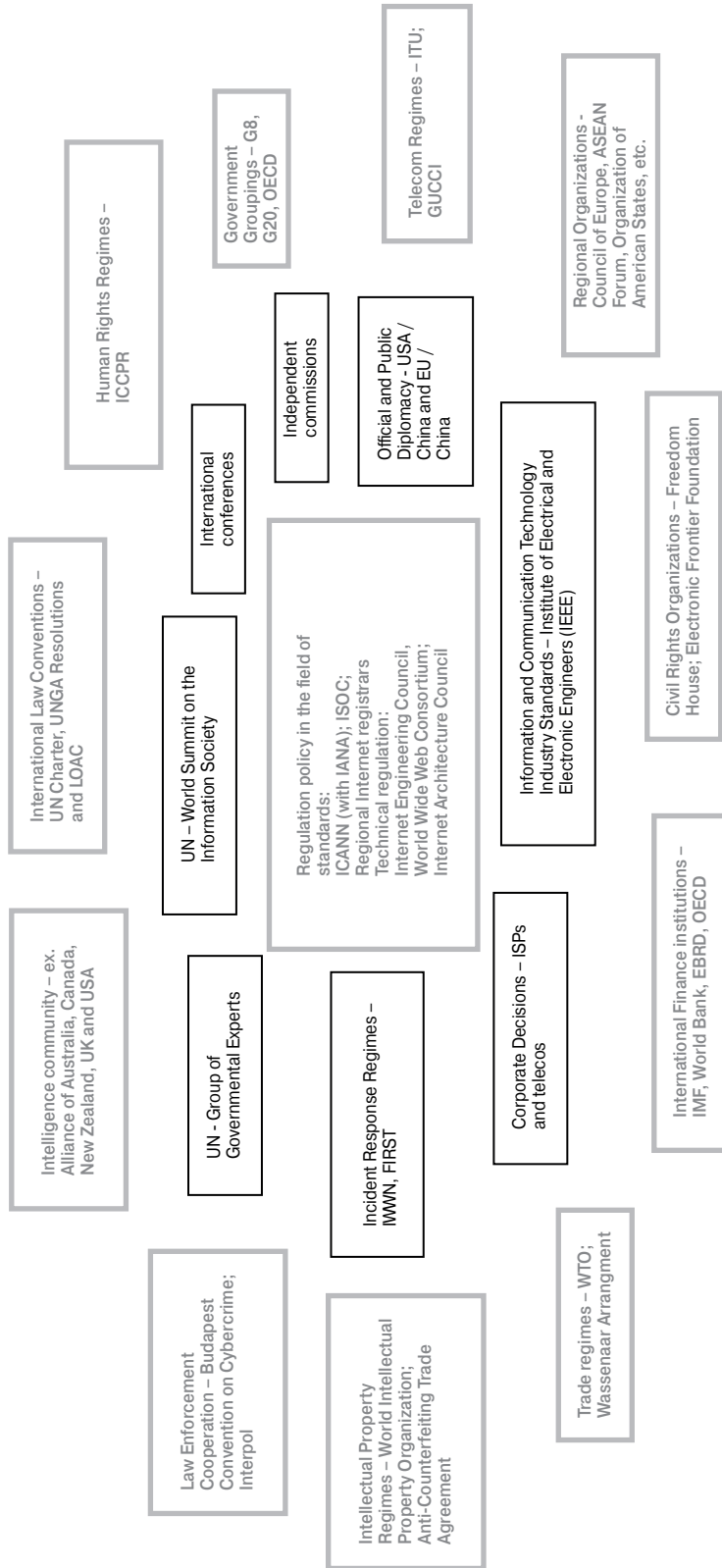


Fig. 1. The Complex System of Cyberspace Management

Source: [Nye, 2014, p. 8].

The actions of states at all levels of Internet governance are dictated by the logic of sovereignty protection. But, in the context of Internet and cyberspace governance, we might use not the traditional approach to sovereignty, but the *digital* one. There are two ways to define the essence of digital sovereignty, which is critical for understanding the current role of states in Internet governance.

The first approach follows the traditional realist and neorealist understanding of the state's role and the properties of state sovereignty in the context of the development of digital technologies. Researchers using this approach maintain the notion of the primacy of the state and national law in the digital (cyber) space, which leads to a similarity between the concepts of classical and digital sovereignty [see Franzese, 2009; Irion, 2012; Polatin-Reuben, Wright, 2014; Qi, Shao, Zheng, 2018; Schmitt, 2013; Ukolov, Cherkasov, 2019; Wu, 1997; Zeng, Stevens, Chen, 2017]. The state's power over the elements of digital infrastructure located in national territories creates the basis for the expansion of sovereignty to cyberspace. Some authors [see Kukkola, Ristolainen, 2018] indicate that such a conclusion is not merely academic. They find its direct expression in the politics of some states – Russia, in particular [Ibid., p. 1]. Similar statements are found in the works of Chinese researchers [Qi, Shao, Zheng, 2018; Zeng, Stevens, Chen, 2017].

The second approach follows a more liberal tradition [see Bratton, 2015; Couture, Toupin, 2019; Gliberman, 1978; Grant, 1983; Istomin, 2020; Mueller, 2017]. Accordingly, the state is seen as one of the carriers of digital sovereignty, along with private companies [Grant, 1983; Istomin, 2020] and individuals [Couture, Toupin, 2019]. A 'blurring' of state sovereignty when attempting to project it into cyberspace is based on several factors, the main one being the creation of new technological solutions by private companies without the participation of states [Grant, 1983] as well as the limited presence of the state in new systems of digital development management [Bratton, 2015]. The inertia of the state in cyberspace means that, in some issues, its role has been limited to standard setting. For example, as in the case of managing the address space of the Internet – the 'legitimacy of the activities' of private companies is recognized 'in the national law of states, in entities..., in international law...' [Istomin, 2020].

Both approaches agree that on the physical level states have many more opportunities to realize their own digital sovereignty than on the information level. The state can control elements of digital infrastructure within its jurisdiction, which makes it possible on the physical level to consider digital sovereignty as identical to the classical, Westphalian notion of sovereignty [Nye, 2014, p. 8]. Conflicts at this level have a horizontal nature, which means states compete with actors of the same nature when exercising their cyber power.

At the information level, the situation is different. In controlling the digital infrastructure up to a certain limit, the state can apply the provisions of its own national law to regulate a separate segment of the Internet, but not the entire system. The conflict in this case has not only horizontal, but also vertical expression – states compete both among themselves and with actors of a fundamentally different nature, for example, with non-governmental organizations such as ICANN and ISOC, which 'take into account opinions, but not the "voices" of states' [Nye, 2014, p. 6]. At the same time, attempts to develop a general consensus on certain issues of Internet governance through international organizations such as ad hoc working groups of the United Nations and the ITU have not led to the development of a universal, practical solution. More results have been achieved at the level of regional and interregional agreements, an example of which is the 2001 Budapest Convention on Cybercrime. However, regarding that convention, the following statement is true: 'The most significant cybercrime agreement to date was agreed upon before Facebook and Twitter, and roughly matches the dawn of digital giant Google. It is unlikely that this agreement will be able to cover the rapid transformation of Internet technologies that we see today' [van Horenbeeck, 2018, p. 6].



Based on the above discussion, we come to the conclusion that some of the very important mechanisms that ensure the functioning of the Internet at the present stage were formed without the participation of states. This is partly due to the insufficient assessment level of accountability of such mechanisms, and, as a consequence, the insufficient level of legitimacy of the Internet governance system as a whole.

In general, the concept of accountability for global governance institutions, to which the mechanisms of Internet governance can certainly be attributed, is based on three components: transparency of the decision-making process; provision of a rationale for decisions and actions; and the ability of actors to impose sanctions in response to decisions and actions taken by the institution [Hilbrich, Schwab, 2018, p. 10].

Accountability is seen as one of the most important components of the legitimacy of global governance institutions [Keohane, 2011, p. 102]. Even if the other criteria of an institution's legitimacy<sup>4</sup> are fully met, the discrepancy between individual components and the expectations of stakeholders inevitably leads to a decrease of the institution's legitimacy. Incomplete evaluative legitimacy of the institution, however, does not negate the possibility of reaching a temporary consensus regarding its actions. Such an outcome may satisfy most of the participants for a certain period of time, but a system of this kind cannot maintain itself in a long run. This inevitably leads to the revision of the status quo.

Thus, we note three characteristics of the modern system of Internet governance. First, this system is complex and multi-levelled. Internet governance itself implies decision-making at two levels – physical (digital infrastructure) and informational (various system-related international regimes, technical standards and addresses). States make decisions primarily at the physical level, establishing rules for the functioning of digital infrastructure on their territory, thereby partially realizing their digital sovereignty. The activities of states at the information level are currently limited by the existing status quo in which non-state actors play a significant role in decision-making.

Second, the current configuration of the Internet's management system does not allow for the emergence of a single centre that makes decisions both at the physical and informational levels. Attempts to attribute the decision-making functions on specific issues of Internet governance to existing international institutions have not had significant success. The current model of Internet governance allows for the existence of many actors with the 'decisive vote,' among which a significant number are represented by non-governmental organizations.

Finally, a logical derivative of the first two characteristics is low accountability of the key institutions and, consequently, the incomplete legitimacy of the Internet's governance system. This will be discussed in more detail in the analysis of the activities and structure of key non-governmental organizations involved in Internet governance – ICANN and ISOC.

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<sup>4</sup> Robert Keohane identifies six criteria of legitimacy: 1) compliance with minimum moral standards (compliance with generally accepted criteria, for example, in matters of ensuring human rights); 2) inclusiveness (the possibility of participation of a wide range of stakeholders in the decision-making); 3) epistemological equality (the availability of information about the activities of the institution to those who are influenced by the decisions made); 4) accountability (the ability of stakeholders to influence decisions); 5) democratic principles of governance (the presence of mechanisms of public control, protection of minority rights, ensuring a general consensus in decision-making at the international level); 6) the creation of comparative advantages (activities on an international basis should bring more benefits than alternative schemes of interaction, for example, on a bilateral basis) [2011, pp. 101–4]. Compliance with some criteria and non-compliance with others, as, for example, occurs in the case of the activities of the UN Security Council in creating comparative advantages [Ibid., p. 105], expresses a lack of confidence in the institution and decisions made on its platform.

## ICANN and ISOC in Internet Governance: Key Features and Imbalances

ICANN and ISOC play a special role in the governance of the Internet and cyberspace. Their task is to develop standards for activities in cyberspace. The IETF and the Internet Architecture Board (IAB), which hold key positions in the development and harmonization of technical aspects of the functioning of the Internet, belong to the system of organizations whose activities are directly supported by ISOC. It is reasonable to argue that ISOC has authority not only in policy but also in applied technology issues (see Fig. 1).

Below, we consider the main characteristics of these organizations and identify the tools with which they participate in Internet governance, as well as the problems that arise in this regard.

### ***Internet Corporation for Assigned Names and Numbers (ICANN)***

ICANN is 'a not-for-profit public-benefit corporation with participants from all over the world dedicated to keeping the Internet secure, stable and interoperable. It promotes competition and develops policy on the Internet's unique identifiers. Through its coordination role of the Internet's naming system, it does have an important impact on the expansion and evolution of the Internet' [ICANN, 2020a].

Technically, ICANN helps to maintain the functions of the Internet Assigned Numbers Authority (IANA), which provides key services for the Internet's basic address book, the domain name system (DNS). ICANN's key sphere of activity is the regulation of the domain name market and the unification of the Internet address system. In addition, the organization performs other functions: Internet-related services, intellectual property protection, and protection of the interests of commercial and non-commercial organizations and Internet users.

ICANN relies on two main tools in its operations: market mechanisms and a deliberative structure. There are two reasons for this. First, the goal is to demonopolize the Internet services market; second, the socio-political agenda is formed from the bottom up. Thus, ICANN's policy is based on a multi-stakeholder consensus-seeking approach.

ICANN member organizations and users form requests at the lower level. They are then reviewed in various advisory committees and working groups. Finally, the recommendations are submitted to the board for voting. As adopted in the bylaws, ICANN organizes international conventions and conferences, thus providing a discussion forum for supporters to discuss policy issues related to the Internet's development. Anyone can join most of ICANN's working groups, ensuring broad representation. The issue is then brought up for public discussion or submitted for revision by the committees. The process is repeated until ICANN stakeholders reach consensus or the board accepts all amendments and proposals.

In a similar way, the corporation builds its relations with organizations representing states and establishes outreach interaction with other international firms, unions and groups. Such interaction primarily relies on market mechanisms and international law, as well as on the civil law of the United States and other states.

The main issue, however, is ICANN's location in California. The organization has a long history of partnership with the U.S. government and of being accountable to the state. The movement toward independence began on 25 November 1998, when ICANN and the U.S. Department of Commerce entered a memorandum of understanding [NTIA, 1998]. The department relied on ICANN to manage some of the technical functions of the DNS, such as numbering Internet addresses, coordinating port assignments and helping to maintain the sta-

bility of the Internet's unique identifiers. The memorandum of understanding required regular reporting to the U.S. Department of Commerce. However, on 10 March 2016 ICANN submitted a proposal to transfer the IANA's governance functions from the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce to the global community.

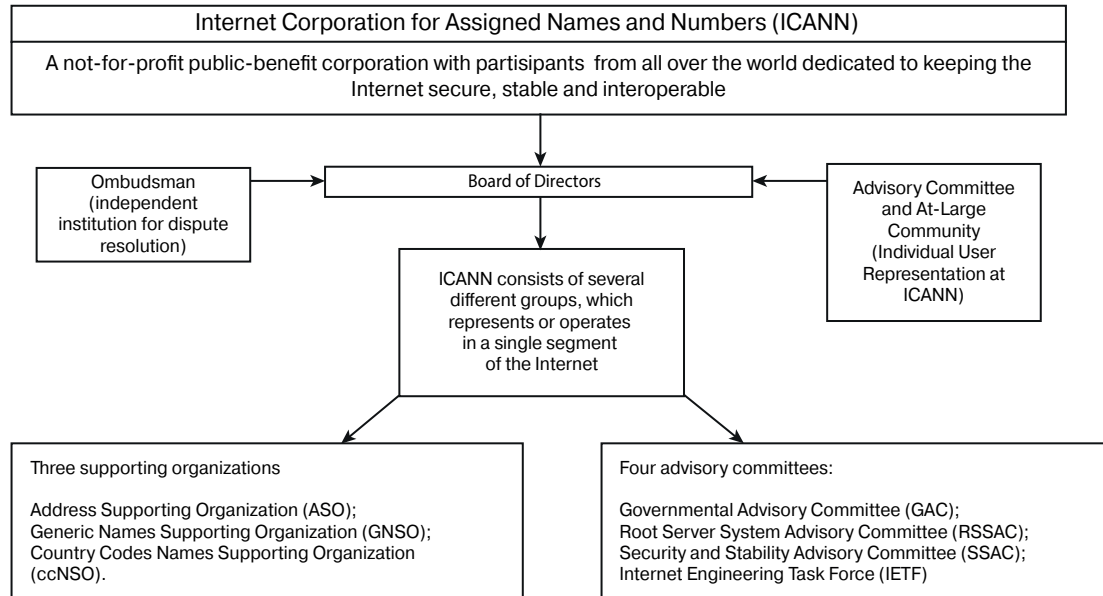


Fig. 2. ICANN's Organizational Structure

Source: Compiled by the authors.

This agreement completed a joint public-private partnership. The overall legal part of these changes was significantly less than the political: the United States retained a reduced, but still real, degree of control. However, the introduction of an additional independent actor to the world arena reduced international tension. The transition from state control to public sector control has solved three problems. The first is related to the issue of the organization's legitimacy. The withdrawal from the influence of the U.S. government improved the organization's reputation in the international arena and reduced tension within the international community [Becker, 2019]. Second, the transition reduced the influence of states on international organizations and unions, in particular in the EU. Third, the main functions of a specific industry were given to the expert community with a bottom-up decision-making system that made it possible to democratize the corporation's activities.

However, ICANN's independence has increased the profile of the Governmental Advisory Committee (GAC). Any ICANN decision concerning member countries must be made in consultation with the GAC [ICANN, 2020a]. The GAC currently has 178 members and 38 observers, the latter including such organizations as the Council of Europe, the International Telecommunication Union, the International Criminal Court, the World Health Organization, WHOIS, the World Trade Organization, the UN Educational, Scientific and Cultural Organization, and others. According to ICANN's charter, decisions of the committee are advisory and 'relate to the activities of an organization affecting the interests of governments, in particular

on the interaction of ICANN rules with various national laws and international agreements, or affecting public policy issues' [ICANN, 2020b].

The GAC has considerable political influence over ICANN. As a result, decisions that are not welcomed by the U.S. and European governments and their most influential business lobbies may not be made in the organization, as the board must find consensus with the committee. On the one hand, each country has only one vote in the committee, which often does not allow for a consolidated decision. On the other hand, regional associations such as the EU have more weight in the committee.

In addition, the domain name system is increasingly influenced by government law enforcement agencies. Some of this influence is channelled through the GAC, but the latter goes through other bodies such as the Generic Names Supporting Organization (GNSO) [Bygrave, 2015].

### **Internet Society (ISOC)**

ISOC was established in 1992 by a group of enthusiasts who had formerly worked for the IETF. ISOC's task was defined as 'to provide an institutional home for and financial support for the Internet Standards process' [Cerf, 1995]. Growth of the Internet ecosystem, the urgent need for regional bodies to maintain the commonality in processing and formulation of the Internet standards, and new technological solutions required financing that exceeded the limits of government-sponsored programmes.

ISOC provides financing for the IETF, the IAB, the Internet Research Task Force (IRTF), the Internet Engineering Steering Group (IESG), the Online Trust Alliance (OTA) and the Public Interest Registry (PIR) (Fig. 3). The ISOC collects membership fees from individual members of the Society and donations from sponsoring companies.

ISOC is administered by a 13-member board of trustees elected by ISOC's regional bodies, member companies and the IETF. In addition to general management, the board governs the work of the IAB. Since the establishment of ISOC, no Russian citizen or representative of Russian information technology (IT) companies has been elected to the board. The largest number of nominations has been given to citizens of the United States [Internet Society, n. d., a].

ISOC provides several privileges to sponsoring companies based on the size of the contribution [Internet Society, n. d., b]. For instance, platinum-tier companies may sponsor specific programmes of the Society and are able to nominate members to the board. Russian companies do not contribute to ISOC. Most of the top sponsors of the Society are U.S.-based IT holdings (see Table 1).

*Table 1.* The Top Sponsors of the ISOC With a Contribution of More than \$100,000

Country of Origin	Name	General Characteristic
U.S.	Comcast	Cable TV/Internet provider
U.S.	Juniper Networks	Communication devices manufacturer
U.S.	NBCUniversal	Cable TV/Internet provider
U.S.	Oracle Corporation	Software company
U.S.	Private Internet Access	VPN provider
The Netherlands	RIPE NCC	Regional Internet addressing administrator

*Source:* [Internet Society, n. d., c].

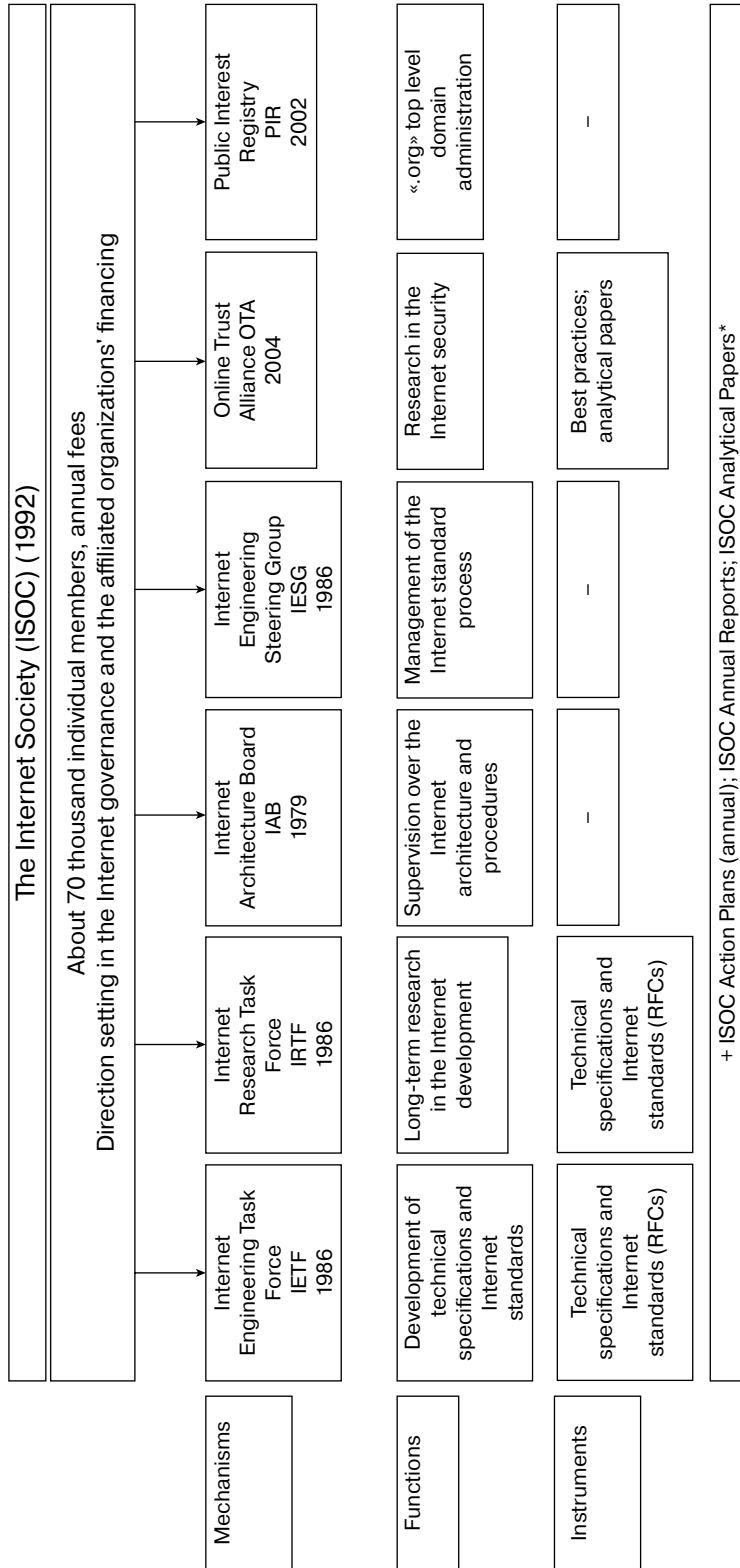


Fig. 3. Organizations Affiliated With the ISOC: Their Functions and Instruments

Source: Compiled by the authors.

ISOC regularly publishes papers on the Internet's development. The instruments created and possessed by ISOC lack formality and there are no established mechanisms for further monitoring and control of the process of implementation of its decisions. ISOC publishes Requests for Comments (RFCs) that serve as the basis for the Internet standard process, Action Plans, Global Internet Reports, analytical papers and best practices on network security (the main responsibility of the ODA).

As the main sponsor of the IETF and the IRTF, ISOC has proprietary rights to the RFCs and the Internet standards. The notion of the Internet standard implies 'a specification that is stable and well-understood, technically competent, has multiple, independent, and interoperable implementations with substantial operational experience, enjoys significant public support, and is recognizably useful in some or all parts of the Internet' [Bradner, 1996, p. 2]. The specification here is 'any description of a protocol, service, procedure, convention, or format' [Ibid., p. 8].

Every active standard of the Internet focuses on a specific issue related to the sustainable operation of the global Internet network. A standard may be described by more than one RFC, based on the complexity of the issue. The relevant RFCs present the description of an issue, propose solutions to the problem and definitions.

Proposals on technical specifications processing are presented by the IETF and the IRTF. The decision on whether a specification is to serve as the Internet standard is the responsibility of the IESG and the IAB. If the conditions mentioned in the definition of the Internet standard are met it will be approved as the universal standard.

The Internet standards are not legally binding. However, their importance for the Internet's functionality raises their status to the level of 'soft law.' The Internet standards approved by ISOC are universally accepted across the Internet. Taking into account the importance of the Internet for manufacturing, communications and governmental affairs, ISOC's Internet standards are thus unique and indispensable.

We witness an important discrepancy between ICANN/ISOC functions and their structure. The Corporation and the Society make decisions on issues that are critically important for the Internet's functioning, but their accountability can be questioned. The soft spot here is the lack of formalized feedback mechanisms to communicate with all Internet users (governments, companies, individuals, etc.) (see Table 2)

Table 2. ICANN/ISOC Accountability Components

	ICANN	ISOC
Transparency	Form 990 financial statement (U.S. standard)	Form 990 financial statement (U.S. standard); Annual activity reports
Decision feasibility	Five-year strategic plan	Annual activity reports
Feedback mechanisms	Governmental Advisory Committee (GAC) <i>The GAC makes non-regulatory decisions</i> The ICANN committees constantly interact with counterparts and end users	<i>Permanent representation of states is not provided</i> Premium corporate membership mechanism Regional and international <i>ad hoc</i> conferences [Internet Society, n. d., d].

Source: Compiled by the authors.

## Conclusion: The Future of the Internet and General Proposals

This analysis shows that decentralization, lack of accountability and unfulfilled legitimacy are the key features of the contemporary Internet governance system due to the passiveness and inability of states to formulate common ground on issues of Internet governance. The Internet as an idea and the conglomerate of various technical specifications has been developed by professional communities, mainly in the U.S. and later with participation from other countries. The system does not imply participation of states in decision-making by default because at the very beginning of the Internet and during its avalanche-like global proliferation in the 1990s its potential as a productive factor was not taken seriously.

The modern decentralized, unaccountable and non-legitimate system of Internet governance is a conflict-generating one by nature. This feature is defined by limitations on states' participation in decision-making and their understanding of digital sovereignty in traditional sovereignty terms. States are eager to specify the rules of the game in cyberspace to maximize their security level. This is an open road for nationalization of selected segments of the Internet in future.

The Internet's nationalization process is intensifying. Countries such as Russia [Kukkola, Ristolainen, 2018] aim at the full realization of their digital sovereignty. This implies further strengthening control over incoming, outgoing and stored data, addressing, and the technical development of the Internet. Attempts to establish a unified standard of Internet policy are considered a violation of digital sovereignty, which thus constrains the formulation of an international consensus [see Wouters, Verhelst, 2020].

Non-governmental organizations such as ICANN and ISOC play a significant part in Internet governance. These bodies secure some degree of consensus on Internet addressing and the standards in use but the situation is far from stable. These NGOs do not provide for the full participation of states in decision-making. ISOC is also characterized by its tendency to be influenced by large corporate units, mostly American ones. ICANN is criticized for being a U.S. tax resident and thus subject to the influence of the U.S. government, plus the inability of other states to exercise any form of control on decisions made concerning Internet addressing.

All in all, our proposals aimed at overcoming the system's disproportions are as follows.

First, the decentralized nature of the Internet is not likely to change in the near future if we consider existing mechanisms and practices. The examples of the unsatisfying results of UN and ITU-led processes prove the political nature of this feature. This factor prevents the formalization of a universally accepted consensus of any kind and thus the current state of affairs may be regarded as the 'best of the worst.'

Second, the accountability issue could be partly settled right now, by contrast with the decentralization problem. Despite the fact that ICANN and ISOC possess some accountability mechanisms, they do not match the current demand, especially in ISOC's case. By contrast with ICANN, ISOC's structure does not include any means to provide necessary feedback for state stakeholders. ICANN has established the GAC to fulfil this task; however, the GAC does not allow state members and other accountability addressees to influence the decision-making process. Thus, the first step toward greater accountability of the Internet governance system could be the establishment of a body with the same functionality as the GAC within ISOC.

However, even if ISOC were to establish a GAC-like mechanism, it would not be enough in terms of accountability. The next step would be to strengthen the authority of the ICANN GAC and the hypothetical ISOC equivalent by giving them voting rights when the board members are to be elected and when choosing strategic priorities. These measures would provide states with almost the same status as the other stakeholders, namely the media corporations, and thus would give a hand to the full realization of the UN declaration [UN 2003].

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# Regional Perspective of Digitalization in BRICS<sup>1</sup>

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## Abstract

*This article is aimed at evaluation of regional digital inequality in BRICS countries. Using the data for 2014–2018 on internet usage and access to fixed broadband author calculates inequality ratios, including coefficient of variation and Theil index. Also author analyzes rural/urban differences and their dynamics. On the base of this calculations author shows decrease of regional inequality in all five countries. Further analysis is devoted to national digitalization strategies, which are aimed at development of remote areas and bridging digital divide. Author shows that there are measures in each strategy aimed at bridging digital divide on all three levels (infrastructure, usage and results). In a final part of the article author suggests directions for cooperation in BRICS, including exchange of best practices in realization of national strategies, composition of best practices in integrated measures aimed at development of remote areas and joint financing using opportunities provided by the New Development Bank.*

**Key words:** digital divide; digitalization; BRICS; regional divide; development of remote areas; internet access

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## Introduction

Cooperation on the digital economy and promotion of the economic development of remote areas was declared a priority by Russia during its tenure as the chair of BRICS in 2020. Digitalization is the process of integrating information and telecommunications technologies (ICTs) into daily routines. It incorporates the following three aspects: creation of a digital infrastructure (including Internet access); development of users' digital literacy; and assurance of social advantages arising from the use of ICTs in day-to-day operations. This process carries a risk of rising inequality, particularly regional inequality, due to the economic inefficiency of digitalization in remote and rural areas, where high costs of infrastructure building are combined with low digital literacy rates and low demand for Internet services.

Reduction of digital inequality constitutes a sustainable development priority; for example, the number of fixed Internet broadband subscriptions and Internet users per 100 inhabitants serve as indicators for the achievement of United Nations Sustainable Development Goals 17.6 and 17.8. In the context of the fourth industrial revolution and acceleration of digitalization processes, the use of digital technologies serves as the premise for the possibility of participating in global value chains, and the gap in access to technologies may serve as an additional source of inequality between different countries and regions within countries, for example, between providers of intellectual capital and physical labour. Digital technologies have become particularly

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<sup>1</sup> The editorial board received the article in August 2020.

significant during the pandemic as prior efforts to ensure broader access to digital technologies has allowed all economic agents to make faster adjustments to their operations under the new circumstances.

All five BRICS members are actively implementing digitalization policies. Therefore, it is important to control potential risks associated with a rise in regional inequality. In order to exercise such control, we must perceive whether an increase in the application of digital technologies at the national level is accompanied by the lagging behind of least developed areas and higher inequality in access to technologies. Moreover, we need to understand how the outcomes of digitalization programmes correlate with wider access to ICTs in least developed regions.

This study analyzes and assesses regional inequality in Internet access in BRICS countries. The objective of the study is to trace the dynamics of regional inequality rates in BRICS countries and determine differences within the group. In order to achieve this objective, the national level of digitalization in BRICS countries was analyzed, and regional digitalization data for the five BRICS members was collected to assess the level of regional inequality for each country. The relevance of this research derives from the implementation of strategies that seek to bridge the digital divide in all BRICS countries and the need to monitor intermediary results.

The article begins with a review of research on the subject and demonstrates that the regional aspect of digitalization in BRICS states has been studied insufficiently. It then considers the main measures introduced by BRICS members with the purpose of decreasing inequality and analyzes differences in Internet access for BRICS members by region. It offers assessments of inequality dynamics as they pertain to Internet access by types of settlements and by regions within BRICS countries. The article concludes with recommendations for cooperation between BRICS members in the field of digitalization.

## Literature Review

Sources on the subject have rather widely covered the issue of digital inequality; they have recognized both the infrastructural and the social aspect [Norris, 2001; Perfilieva, 2007; Song, 2020] and actively explored the effect of digitalization on economic indicators such as output, performance, employment, income and poverty [Hofman, Aravena, Aliaga, 2016; Jung, Lopez-Bazo, 2020; Katz, Callorda, 2018; Niebel, 2014]. One study [Hofman, Aravena, Aliaga, 2016] identifies two channels for affecting macroeconomic indicators: satisfaction of demand on digital products (devices and software) and an increase in efficiency, employment and investment in economic segments that use information technologies. Still, the effect on economic indicators varies depending on the use of different technologies (e.g. fixed and mobile communications), the difference in a country's level of development [Niebel, 2014] that expands their application, and the default level of technologies' development and their coverage [Katz, Callorda, 2018].

The overwhelming majority of sources use national-level indicators, even though they do not capture the evenness of digital technologies' coverage and may favour countries with a high degree of urbanization and with only large cities being connected to digital technologies [Lucendo-Monedero, 2019]. Assessments that use regional data remain rather fragmented, and they typically consider the situation in just one country. Studies that explored the effect of the geographic factor on digitalization levels in the U.S., Japan and Indonesia [Jung, Lopez-Bazo, 2020; Lucendo-Monedero, 2019] showed that this factor plays an important role in explaining the differences in levels of the digital divide, which is why the development of access to ICTs should prioritize the least developed, hard-to-reach and remote areas.

A study on the use of ICTs in Chinese provinces [Song, Wang, Bergmann, 2020] analyzed data on access to digital technologies and their use by Chinese prefectures in 2016 and came to the conclusion that the digital divide exists at all three levels. Another study on Chinese provinces [Liu, Wang, 2019] showed that the implementation of the national plan for spreading broadband Internet facilitated an increase in Internet coverage in China in 2012–15 and, in most cases, promoted the alignment of provinces according to Internet accessibility and use. A study on Brazilian regions [Jung, Lopez-Bazo, 2020] established that in 2007–11 production efficiency depended on broadband Internet access in Brazil at the level of states, but the author also noted the unevenness of obtained results. As for Russia, the Analytical Center for the Government of the Russian Federation points out that regional idiosyncrasies constitute an important factor affecting the digitalization level of Russia's constituent entities and that “the problem often occurs because building communication networks in scarcely populated and remote areas is not economically feasible” [Analytical Center, 2019, p. 23]. A study by M.Yu. Arkhipova and V.P. Sirotin exposed a large divide in wired network technologies compared against “the digital gap in basic ICTs” [2019, p. 676]. In their study of access to ICTs in India, T. Agarwal and P.K. Panda [2018] used 2008–17 data to show an increase in inequality between states, despite faster access growth in less developed states. Another study on India [Bera, 2019] reported similar results based on 2006–16 state-level data and came to the conclusion that differences in digitalization drivers (infrastructure, human capital and provider competition) between states were rising along with an increase in accessibility of digital technologies in all states. It appears that, due to the lack of long-term records on digitalization levels in South Africa, there are no studies dedicated exclusively to the analysis of regional inequality in the field of digitalization, albeit it has been noted that such research is necessary [Bornman, 2015].

Differences in development levels of BRICS members' regions [Analytical Center, 2018] and their urban and rural areas allow for the assumption that the coverage and use of digital technologies are distributed unevenly in these countries. Wider Internet coverage in rural and remote areas may expand the range of opportunities available to their inhabitants and result in business development, performance improvement in agriculture and better access to healthcare and education [Deng, 2019; Jung, Lopez-Bazo, 2020; Lucendo-Monedero, 2019]. Numerous studies [Agarwal, Panda, 2018; Bera, 2019; Jung, Lopez-Bazo, 2020; Liu, Wang, 2019; Song, Wang, Bergmann, 2020] point out the importance of monitoring and overcoming the digital divide, particularly at the regional level, in BRICS countries. Still, there have been no attempts to assess regional inequality as it pertains to access to digital technologies in all five member countries.

Scholarly research also points out the importance of cooperation on digitalization between BRICS countries. For example, information and communications technologies were labelled a priority in science and technology cooperation between BRICS members [Sidorova, 2018; Sokolov et al., 2017] and cooperation on the development of global rules that would regulate the digital space [Ignatov, 2020; Tkachenko, 2018].

## Digitalization Programmes in BRICS Countries

Bridging the digital divide is a priority for all BRICS members given its promise to decrease inequality. The first part of the Brazilian Digital Transformation Strategy is dedicated to increasing the accessibility of digital technologies and expanding broadband Internet coverage nationwide, including remote and isolated areas. In India, the expansion of mobile network coverage and development of broadband Internet infrastructure constitute two main directions of the Digital India programme. A more detailed action plan is presented in the National Digital Communi-

cations Policy, which was adopted in 2018, and BharatNet – a programme for connecting rural areas to the national optical fibre network – which was implemented in 2012. In China, one of the priorities included in the 13th Five-Year Plan for 2016–20 stipulates the provision of access to broadband networks in remote mountainous areas, islands and reefs. In Russia, Internet access for small settlements is part of the Digital Economy national programme. In South Africa, the South Africa Connect strategy envisions an increase in broadband Internet accessibility and speed. Measures stipulated under these programmes target a decrease in the digital divide at all three levels (Table 1).

The most popular measure for spreading Internet access is infrastructure building, and it is included in the programme documents of all five countries. At the same time, national objectives on broadband Internet coverage and speed vary greatly by their outreach. Each country's specific objectives are provided in Appendix 1. At the second level, all five countries are implementing the same measure of connecting state agencies to the Internet. In addition, Russia and India stipulate measures that target higher digital literacy and, given the commitment to this objective and low digital literacy rates in other BRICS countries, Russia introduced the initiative to launch the BRICS Digital Literacy School [TPP RF, 2019] and exchange best practices in this area. Measures targeting the expansion of opportunities related to digital technologies, as well as measures stipulated at other levels, are predominantly related to the public sector. Indeed, the state plays a critical role not only in spreading Internet access but also in creating and using accessible Internet services and clear digital content for its population with low digital literacy. That is why digitalization of public services can both decrease related costs and create stimuli for the development of digital competences.

*Table 1.* Examples of Measures Aimed at Bridging the Digital Divide in National Digital Strategies of BRICS Countries

<b>Brazil</b>	<b>Russia</b>	<b>India</b>	<b>China</b>	<b>S. Africa</b>	
Level 1: Access					
Infrastructure building	+	+	+	+	+
Decrease of costs for telecommunications companies, which increase mobile internet coverage (tax relief, decrease of licenses costs)	+		+		
Usage of mixed financing sources (PPP, special-purpose funds)	+	+	+		
Standardization of costs and time for infrastructure building			+		
Joint usage of existing infrastructure by telecommunications companies		+	+		
Level 2: Usage					
Connection of public agencies, including educational, in rural and urban areas, to broadband internet	+	+	+	+	+
Increase of digital literacy	+	+	+		
Increase of qualification of public servants in digital sphere					+

Brazil	Russia	India	China	S. Africa	
Level 3: Opportunities					
Digitalization of public services, development of e-government, provision of information to the public	+	+	+	+	+
Development of national vacancies database		+			
Development of biometric identification system	+	+	+	+	+

*Source:* [Digital India, n. d.; Government of Brazil, 2018; Government of India, 2018; Government of the People's Republic of China, 2016; Government of the Russian Federation, 2018; Government of South Africa, 2013].

## Analysis of the Digital Divide in BRICS Countries

BRICS countries have been successful in spreading digital technologies and decreasing the digital divide, even though their accessibility varies between members. The digital divide can be defined as “the gap between individuals, households, businesses and geographic areas with regard both to their opportunities to access information and communication technologies and to their use of the Internet for a wide variety of activities” [OECD, 2001, p. 5]. In order to assess the divide, it is necessary to account not only for the level of digital infrastructure development but also the population's opportunities for accessing new technologies, as well as the existence of advantages in the use of digital technologies, including a developed market of e-commerce and electronic public services. With the development of digital infrastructure, the so-called digital divide of the second level, that is, “capabilities for harnessing digital data and frontier technologies” [UNCTAD, 2019, p. 16], comes to the fore. But BRICS countries must still pay attention to the issue of developing physical infrastructure, even though China has become a leader in development of the digital economy alongside the U.S. [UNCTAD, 2019].

There are rather extensive data on BRICS members at the national level, which allows for an assessment of the degree of the digital divide compared to economies with the most developed digital segments. Singapore and Sweden were selected for comparison because they are included in the top five of most rankings. For example, both countries are in the top five of the Networked Readiness Index [Dutta, Lanvin, 2019] and Global Competitiveness Report – 3d Pillar [WEF, 2019]; Singapore is in the top five of the Mobile Connectivity Index [GSMA, 2019] while Sweden is in the top five of the Inclusive Internet Index [2020].

BRICS countries are heterogeneous by the level of their digital divide. For example, in certain aspects (number of fixed broadband subscriptions, average download speed through mobile broadband access and number of active social media users) China is outperforming even developed countries. In some areas (e.g. international bandwidth, share of Internet users and price of fixed Internet subscriptions), Russia also demonstrates a rather high level compared to other countries, whereas the majority of India's and South Africa's indicators are at an extremely low level even when compared to other developing countries.

It is impossible to perform a detailed analysis at the regional level for all five BRICS members due to data fragmentation, so for this analysis two main indicators were selected – Internet use by the population and access to fixed broadband Internet – because they, out of all available indices, allow for the most comprehensive assessment of the presence or absence of the digital divide. The first indicator reflects opportunities for using digital technologies available to a region's population, and the second indicator attests to the accessibility of relevant infrastructure.

Table 2. Digital Divide Indicators on Three Levels: BRICS, Singapore and Sweden

Brazil	China	India	Russia	S. Africa	Singapore	Sweden	
Access							
Fixed broadband subscriptions (per 100 inhabitants)	13.8	29.2	1.3	21.7	2.5	28.0	39.8
Active mobile-broadband subscriptions (per 100 inhabitants)	88.1	95.4	37.5	87.3	76.0	145.7	123.0
3G Coverage (% pop.)	95.5	99.4	94.0	78.0	99.5	100.0	100.0
Download speed, fixed bb (Mbps)	47.8	101.3	38.0	60.7	27.9	193.2	127.9
Download speed, mobile bb (Mbps)	23.8	58.4	11.2	20.4	34.9	53.6	47.3
International Internet bandwidth (bit/s)	29.2	27.7	25.9	68.0	10.5	954.3	67.7
Usage							
Internet users (% pop.)	69.8	52.9	37.0	82.4	61.8	88.2	92.1
Use of virtual social networks (% pop.)	66.0	71.0	23.0	49.0	40.0	79.0	72.0
Internet shopping (% pop.)	24.0	39.0	2.9	26.0	7.9	63.0	77.0
Adult literacy (% pop.)	93.2	96.8	74.4	99.7	87.0	97.3	99.0
Tax to cost of ownership of mobile phone (%)	33.2	13.0	23.3	18.0	14.0	7.0	25.0
Fixed BB subscription charge (% GDP per capita)	2.4	2.2	4.5	0.5	2.7	0.8	1.0
Opportunities							
OSI (Online Service Index)	0.9	0.9	1.0	0.9	0.8	1.0	0.9
Firms with website (% of firms)	54.0	66.1	48.9	64.6	36.0	-	92.4
Number of active mobile applications developed per person	73.4	67.5	61.9	75.8	67.8	97.2	88.2
Value added of ICT sector (% GDP)	2.7	4.8	5.1	2.1	2.1	9.0	5.6

Source: [Dutta, Lanvin, 2019; GSMA, 2019; Inclusive Internet Index, 2020; ITU, n. d.; UN, 2018; UNCTAD, 2019; UNESCO UIS, n. d.].

Analysis of spatial inequality in Internet access by region for BRICS countries is based on their national statistics. Data on Internet use in Brazil come from polls taken by Tecnologia Informação e Comunicação da Pesquisa Nacional de Amostra de Domicílios (TIC PNAD) [IBEG, n. d.] in 2005, 2008, 2011 and 2013–17, but disaggregation by state is available only for 2005, 2008, 2014, 2016 and 2017. Assessment of fixed access to broadband Internet relies on data from the Brazilian Association of Telecommunications (Telebrasil) database [n. d.]. Information on India is taken from annual India Telecoms Reports, which have been published



by the Ministry of Communications of India [Government of India, n. d.] since 2004, but data breakdown by state has been provided only since 2014. For China, data on access to information technologies have been provided annually since 2011 in the China Statistical Yearbook published by the National Bureau of Statistics of China [n. d.]. For Russia, data on Internet use are collected under the federal statistical sampling on the use of information technologies and information and telecommunications networks published by the Federal State Statistics Service [n. d.] since 2013. Information on fixed broadband Internet access has been included in statistics published by the Ministry of Digital Development, Communications and Mass Media [n. d.] since 2011. For South Africa, data on the use of digital technologies with breakdown by province has been published since 2015 in the annual report of the Independent Communications Authority of South Africa [ICASA, 2019].

In order to compare data on Internet use at the regional level in BRICS countries, the constituent entities (states, provinces, etc.) of each country were split into four groups – financial and economic centres, developed, medium developed and less developed – based on the classification suggested by the Analytical Center for the Government of the Russian Federation [Analytical Center, 2017; 2018].

As expected, analysis of data on Internet use at the regional level in BRICS countries shows (Table 3) that, typically, inhabitants of more developed regions use the Internet more actively (except for Russia), and the share of population using the Internet is increasing for all groups of regions. In Russia, the absence of a clear correlation between the development level of a constituent entity and Internet use is related to geographic idiosyncrasies. Less developed areas may have sparse highly urbanized populations (e.g. Magadan Oblast) and, consequently, better opportunities for accessing digital technologies. At the same time, some more developed regions (Vologda Oblast, Pskov Oblast and Tambov Oblast) have a large number of small settlements with fewer than 100 inhabitants, which renders the development of Internet access economically unfeasible for telecommunications providers. A similar situation can be observed when comparing access levels in medium developed and developed regions of South Africa. According to the classification of the Analytical Center, KwaZulu-Natal province is a developed region due to its large share of the processing industry in the implicit gross regional product (GRP) by purchasing power parity (PPP), but the level of Internet use on its territory (55%) is lower than in the medium developed provinces of Mpumalanga (63%) and Free State (61%).

*Table 3.* Share of Population Using Internet, Breakdown by Regions of BRICS Countries, 2014 and Latest Available Data

	Brazil		India		China		Russia		S. Africa	
	2014	2017	2014	2018	2014	2016	2014	2018	2015	2017
Financial and economic centres	67.8	80.9	54.8	96.2	72.4	75.9	79.4	87.7	64.5	72.4
Developed	55.9	73.1	23.3	45.7	53.9	58.6	74.3	80.6	42.3	54.8
Medium-developed	44.2	62.9	18.9	35.6	44.5	49.8	70.3	78.7	50.8	59.1
Less developed	40.9	56.6	14.5	28.9	37.5	44.3	68.5	82.7	42.7	47.7
<i>Total</i>	<i>54.9</i>	<i>69.8</i>	<i>20.0</i>	<i>37.0</i>	<i>47.4</i>	<i>52.9</i>	<i>64.9</i>	<i>82.4</i>	<i>48.7</i>	<i>61.8</i>

*Source:* Author's calculations.

Analysis of the accessibility of fixed broadband access (Table 4) foregrounds the dependence of accessibility on a region's development level. Table 4 shows that the National Broadband Development Plan before 2020, which specifically emphasizes the need for a balanced development of regions and an even access to high-speed Internet, has had a rather strong positive effect. We can see that China's less developed provinces were the most successful in increasing access level in 2014–18.

*Table 4.* Share of Population Using Fixed Broadband Internet, Breakdown by Regions of BRICS Countries, 2014 and Latest Available Data

	Brazil		India		China		Russia	
	2014	2017	2015	2018	2014	2018	2014	2018
Financial and economic centres	19.2	21.4	3.7	5.1	23.2	30.8	18.5	24.3
Developed	12.1	14.9	1.6	1.8	13.3	31.4	17.4	22.0
Medium-developed	5.1	6.9	0.7	0.8	8.9	26.6	14.5	19.8
Less developed	5.0	6.5	0.5	0.6	7.0	25.7	7.7	10.4
<i>Total</i>	<i>11.8</i>	<i>13.8</i>	<i>1.2</i>	<i>1.3</i>	<i>14.7</i>	<i>29.2</i>	<i>17.0</i>	<i>21.7</i>

*Source:* Author's calculations.

## Assessment of BRICS Countries' Regional Inequality in Internet Access

### **Methodology**

Dynamics of the regional digital divide in BRICS countries are assessed based on spatial inequality indicators for 2014–18. Sources on the subject suggest several different spatial inequality indicators [Luk'ianova, 2007], the most prominent being: absolute range of variability, relative range of variability, variation ratio and the Theil index. The interpretation and data record of the aforementioned indices for assessing the level of digitalization development are provided below.

*Absolute range of variability* is calculated as the difference between the maximum and minimum values of the variation sampling:

$$Ra = \text{Max}(y) - \text{Min}(y), \quad (1)$$

where  $y = (y_1, y_2, \dots, y_n)$  stands for the vector of the shares of population with Internet access in  $n$  regions/constituent entities of a country.

Experiential studies rarely use this indicator because the minimum and maximum values often prove to be outlying cases obtained as a result of observation errors, and their inclusion would skew the findings of a study. Nevertheless, when assessing differences in the level of digitalization, it is this indicator that can rather adequately reflect the differences in accessibility of technologies between the most and least developed regions. Moreover, only this indicator can be used to assess inequality dynamics between urban and rural areas because there are only two parameters (urban/rural) for each country at each moment in time.

*Relative range of variability* is calculated as the proportion of the difference between the maximum and minimum values to the mean value:

$$R_r = \frac{\text{Max}(y) - \text{Min}(y)}{\bar{y}}, \quad (2)$$

where  $y = (y_1, y_2, \dots, y_n)$  stands for the vector of the shares of population with Internet access in  $n$  regions/constituent entities of a country,  $\bar{y}$  stands for the average share of population with Internet access.

This indicator's weaknesses are similar to the drawbacks associated with the absolute range of variability.

*Variation ratio* is defined as the proportion of the standard deviation to the mean value and assesses the range of variation from the mean level. The ratio increases with the rise in differences between territories.

$$V = \frac{\sqrt{(y_i - \bar{y})^2}}{\bar{y}}, \quad (3)$$

where  $y_i$  stands for the share of population with Internet access in a region  $i$ ,  $\bar{y}$  stands for the average share of population with Internet access.

The ratio is highly sensitive to outlying cases and strong deviations from the mean; the weight of small deviations decreases, and the weight of large deviations increases in the total sum of deviations.

The Theil index constitutes a special case of the so-called "generalized entropy indices" and is calculated using the following formula:

$$T = \frac{1}{n} \sum_{i=1}^n \left( \frac{y_i}{\bar{y}} \ln \frac{y_i}{\bar{y}} \right), \quad (4)$$

where  $y_i$  stands for the share of population with Internet access in a region  $i$ ,  $\bar{y}$  stands for the average share of population with Internet access;  $n$  stands for the number of regions.

The Theil index assigns the same weight to observations over the entire distribution scale and is equally sensitive to changes in the level of access over the entire distribution scale, which is why it may be argued that it is best suited for the purposes of this study.

## Results

The development divide between urban and rural areas is common knowledge in the scholarly literature, but it takes on special meaning in the context of digitalization. First, rural areas are less densely populated and, therefore, require a much more intricate infrastructure, both for fixed and mobile access. Second, the rural population is typically less educated (this applies to its digital literacy as well), so it may not use digital infrastructure even if it exists, which makes the development of access less feasible for communications providers. Third, weak transport infrastructure in rural areas discourages the development of various elements of the digital economy, including e-commerce, due to high shipping costs and inefficiency of opening pickup points.

All BRICS members exhibit lower Internet use in rural areas compared to urban areas (Table 5), whereas the national level depends, to a great extent, on the share of the rural population, which is the highest in India (as of 2018, 66% of the population lived in rural areas). In India and China, differences between urban and rural territories increased in 2014–18; in Brazil, Russia and South Africa, they dropped. In other words, from the urban/rural perspective, inequality decreased in Brazil, Russia and South Africa and rose in India and China.

Table 5. Share of Population Using Internet in Urban and Rural Areas, BRICS, 2014, 2018

	2014				2018			
	Urban	Rural	Absolute Range of Variability	National Level	Urban	Rural	Absolute Range of Variability	National Level
Brazil	72	32	40	55	80	59	21	70
India	42	11	31	20	76	16	59	37
China	63	29	34	47	75	35	40	53
Russia	70	51	19	65	82	71	11	82
S. Africa*	51	34	17	49	62	40	22	62

Source: Author's calculations based on Federal State Statistic Service [n. d.], Government of India [n. d], IBGE [n. d.], ICASA [2019] and National Bureau of Statistics of China [n. d.].

\*Note: For South Africa data are for 2015 and 2017 respectively.

If the regional aspect of inequality is considered, all BRICS countries exhibit the same tendency toward a decrease in the level of inequality, as manifested in the dynamics of three out of four indicators (with the exception of the absolute range of variability, which increased in India, Russia and South Africa). For India, the increase can be explained by the prominent role of outlying cases which factored into the calculation of this indicator: the share of mobile and fixed Internet subscriptions in New Delhi is almost two times higher than in the state of Himachal Pradesh, which is ranked next. In Russia, the increase in the absolute range of variability in 2018 compared to 2014 is tied to the instability of this indicator (26 in 2014, 28.5 in 2015, 23.4 in 2016, 25.9 in 2017 and 27.5 in 2018), which, in turn, can be explained by close values for different regions and changes in their positions in the ranking.

Table 6. Inequality Indicators for the Share of Population Using Internet, by Regions of BRICS

	Brazil		India		China		Russia		S. Africa	
	2014	2017	2014	2018	2014	2016	2014	2018	2015	2017
Absolute range of variability	55	37	81	146	41	38	26	28	26	30
Relative range of variability	1.11	0.56	3.82	3.58	0.89	0.72	0.36	0.34	0.52	0.51
Variation ratio	0.233	0.138	0.690	0.687	0.247	0.190	0.079	0.071	0.176	0.160
The Theil index	0.028	0.009	0.170	0.168	0.03	0.02	0.003	0.002	0.013	0.011

Source: Author's calculations.

The lowest level of interregional divide in Internet use is observed in Russia, followed by Brazil, which achieved a dramatic decrease in the level of interregional inequality over the reporting period, possibly due to pursuing an active policy on digitalization of agriculture and rural areas.

As for infrastructure building (providing access to fixed broadband Internet), the situation is similar in all countries but India, where the level of inequality between states shows a signifi-

cant increase over the reporting period (Table 7). This can be attributed to India emphasizing the development of mobile Internet, which, according to the International Telecommunication Union [ITU, 2019], constitutes an efficient strategy in developing countries because the development of mobile Internet at a lower level of economic development has a larger effect on the national gross domestic product (GDP). Research indicates that a 10% increase in mobile broadband Internet coverage results in a 1.8% GDP increase in middle-income countries, whereas the expansion of fixed broadband Internet coverage accounts for only a 0.5% increase in GDP [ITU, 2019, p. 2].

*Table 7. Inequality Indicators for the Share of Population Subscribed for Fixed Broadband Internet, by Regions of BRICS*

	Brazil		India		China		Russia	
	2014	2017	2015	2018	2014	2018	2014	2018
Absolute range of variability	18	19	6	9	17	26	31	35
Relative range of variability	2.10	1.80	5.28	6.60	1.17	0.91	1.91	1.85
Variation ratio	0.60	0.52	1.14	1.31	0.32	0.21	0.40	0.34
The Theil index	0.16	0.12	0.47	0.55	0.05	0.02	0.10	0.07

*Source:* Author's calculations.

Thus, the results of this analysis of the digital divide between rural and urban areas, as well as between regions of BRICS countries, allow for the conclusion that interregional inequality decreased over 2014–18. These results conform to the findings obtained in a study on China [Liu, Wang, 2019] but do not support conclusions for India [Bera, 2019; Agarwal, 2018]. This discrepancy may be related to several factors, the main one being the time period under consideration. First, the aforementioned studies stop at 2016, whereas major programmes seeking to decrease digital inequality in India were launched in 2012 (BharatNet programme for connecting rural areas to the national optical fibre network) and 2015 (Digital India); de facto core measures were taken toward the end of the studied period, which could affect obtained results. This study covers the period when major programmes for decreasing digital inequality were already in place. It is also worth noting that India, unlike other countries, exhibited an insignificant decrease in inequality, so the rise in inequality prior to the implementation of special programmes could indeed affect final results. Second, the previous studies use standard deviation to measure inequality, which assigns considerable weight to outlying cases in the top part of the distribution, which, given a significant deviation for Delhi, may significantly affect obtained results. In this study, results are more stable because several indicators were simultaneously applied in order to assess inequality.

### **Conclusions and Potential Areas of Cooperation**

The importance of digital technologies and digitalization has been emphasized at all BRICS meetings, but cooperation in this area has been developing particularly actively since 2015, when Russia chaired BRICS. At the 2015 Ufa summit, quite a bit of attention was dedicated to potential cooperation on the development of digital infrastructure. The Ufa Declaration welcomed the inclusion of issues related to the development of digital technologies – providing the poorest population with access to mobile Internet – into the development agenda [BRICS,

2015a]. The Physical Connectivity section of the Strategy for BRICS Economic Partnership identified fostering the development of transportation and communication infrastructure as a priority area of cooperation [BRICS, 2015b]. In addition, BRICS ICT ministers held their first meeting, and the BRICS Working Group on ICT Cooperation was created. Following that, the Goa Declaration, which was adopted in 2016 at a BRICS summit hosted by India, pointed to the need to exchange experiences among BRICS countries in order to bridge the digital divide, in particular by enhancing access to e-commerce [BRICS, 2016]. The issue of cooperation on digital technologies was also discussed in Johannesburg in 2018. Summit participants approved the initiative on the establishment of the Partnership on New Industrial Revolution (PartNIR), which, among other things, seeks to achieve an increase in inclusiveness [BRICS, 2018]. Throughout 2019, the PartNIR Advisory Group worked out the details and plan of action, which were approved in September 2020. Moreover, the 5th BRICS ICT Ministers Meeting was held in 2019. Its participants established an increase in connectivity and access to digital technologies as one of their priorities because connectivity and access to digital technologies serve as key enablers of the digital economy, inclusive growth and sustainable development [BRICS, 2019]. In 2020, cooperation on digital technologies and development of remote areas was declared a priority during Russia's tenure as BRICS chair [BRICS-Russia, 2020].

This study shows that all BRICS members have achieved certain success in decreasing internal inequality in accessibility and use of digital technologies, but countries' levels still vary. That is why interaction on overcoming the digital divide may start with exchanging experiences in the development of national strategies and measures for their implementation, as well as the introduction of amendments based on international practices. Apart from BRICS countries, this experience can be used by other developing countries, especially those that have not yet adopted national strategies on increasing accessibility of digital technologies.

The second potential area of cooperation may be to compile best practices and experiences in the implementation of specific projects on digitalization of remote areas, including the delineation of the most efficient technologies and approaches to bridging the digital divide. Since the development of digital technologies' accessibility in remote and rural areas requires an integrated approach that would combine the development of the digital economy as a whole with an increase in demand on mobile services, it is extremely important to exchange experiences in combining various practices with proven efficiency.

The third area is related to utilizing the potential for joint financing of projects on economic development and integration of remote areas, including using the New Development Bank as a source of funding. Indeed, the Bank's mission is to support infrastructure building and sustainable development efforts, but the current list of approved and proposed projects does not feature any digitalization initiatives, even though some related measures are embedded in certain projects supported by the Bank. For example, the Pará Sustainable Municipalities Project intends to extend the existing fibre optic cable by 1,000 km and provide Internet connectivity to 29 municipalities [NDB, n. d., a], and the Shengzhou Urban and Rural Integrated Water Supply and Sanitation Project stipulates measures for implementing smart water management systems. At the same time, the Bank, based on its mission, has the potential to expand its engagement in issues related to decreasing the digital divide in BRICS countries.

Thus, BRICS countries have a rather high potential for cooperation in bridging the digital divide. By unlocking this potential, they can facilitate sustainable and inclusive development of all five BRICS members.

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# Sustainable Development and Digitalization: The Unusual COVID-19 Crisis Requires Original Solutions<sup>1</sup>

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## **Abstract**

*This article provides a content analysis of over 20 policy proposals for coping with the COVID-19 crisis that have been published by influential international organizations, governments, corporations, academics and civil society groups. The current situation, the role of digitalization during the crisis, and the composition of anti-crisis measures already taken by the world's largest economies are investigated, and long-term measures are proposed aimed at restoring the global economy and moving toward more equitable and sustainable development.*

*The authors identify a significant green component in public policy proposals published since the pandemic began and note that many proposals relate to equity and inclusiveness in development and meeting the needs of individuals. The authors further identify key areas of sustainable development that require action in the near future and which can create new opportunities for economic development: renewable energy and clean transport, cyclical economy, digitalization and environmental protection. At the same time, it is noted that the transition to a green economy is of a long-term nature and may conflict with the need in the short term to support the economy in overcoming the crisis.*

*These priority areas for government action require attention within the framework of Russia's anti-crisis policy. Given the sharp drop in oil prices, the acceleration of digitalization and decarbonization, and the magnitude of the 2020 economic crisis, Russia needs to begin an accelerated transition to low-carbon energy, a cyclical economy and the restoration of its ecosystems with accelerated digitalization.*

**Key words:** Sustainable Development Goals (SDGs); Agenda 2030; digitalization; COVID-19 pandemic; anti-crisis policy

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## Introduction

The COVID-19 pandemic has significantly changed the lives of millions of people around the world as well as economic relations. It has led to temporary breaks in production, logistics and commercial processes. Many companies have temporarily transferred their employees to remote work and are starting to deliberate on remote employment in the longer term. In the first half of 2020, Internet usage intensity in the world increased by 50–70% [Ramos, 2020]. Energy demand has dropped significantly. At the end of 2020, the International Energy Agency (IEA) expects a 5% decrease in global electricity demand. Traditional electric power generation (using fossil fuels and nuclear energy) is declining, with only renewable energy generation showing growth [IEA, 2020a]. A sharp decline in mobility has reduced the demand for oil – according to the Organization of the Petroleum Exporting Countries (OPEC) forecasts, in 2020 the world may consume 10% less oil than in 2019 [Lawler, 2020].

These unprecedented changes will have dramatic economic consequences, and their magnitude has not yet been fully realized. In June 2020, the International Monetary Fund (IMF) expected the global economy to shrink by 4.9% in 2020, which is 1.9% lower than the April forecast by same organization [IMF, 2020]. The June 2020 forecast of the World Bank predicts a 5.2% decline in the global gross domestic product (GDP) in 2020 [World Bank, 2020]. The world has not experienced such a deep recession since the end of World War II.

All this raises questions about how to pursue future development. Shall we support mature industries and large corporations first or shall we emphasize small and medium enterprises? Shall we invest in large-scale infrastructure projects, many of which cause serious harm to the environment, or prioritize infrastructure projects with reduced environmental pollution and greenhouse gas emissions? Is it necessary to support traditional businesses or focus on creating conditions for innovations and new green sectors?

The concept of sustainable development has become the most important development paradigm in recent years. It was the basis of the United Nations (UN) General Assembly resolution “Transforming Our World: The 2030 Agenda for Sustainable Development” (Agenda 2030), adopted in 2015 by 193 UN member countries. The 2030 Agenda includes 17 interrelated sustainable development goals (SDGs) and 169 corresponding targets, which imply coherent development in three areas: economic growth, social justice and environmental protection. This document refers to all states, as well as to commercial and non-commercial organizations. It is assumed that national governments and regional administrations, as well as corporate management, universities and non-profit organizations, will voluntarily localize the SDGs, implement them and thus contribute to the implementation of the global Agenda 2030.

Despite the fact that the concept of sustainable development emerged almost half a century ago, there are still quite few solid scientific research papers on this topic. In foreign studies, authors predominantly investigate the relationships between various SDGs [Biggeri et al., 2019; Le Blanc, 2015; Zhou, Moinuddin, 2017] as well as the inclusion of the 2030 Agenda into national development strategies [Bickler, Morton, Menne, 2020; Sebestyén, Domokos, Abonyi, 2020]. In Russia, several works have been devoted to the adaptation and implementation of the SDGs [Ignatov et al., 2019; Lanshina et al., 2019]. Some investigate the situation in Russia

[Bobilev, Solovyova, 2017; Sakharov, Kolmar, 2019] and the role of business in achieving the SDGs [Dunayev, Nagornov, 2017].

With the global COVID-19 pandemic crisis, sustainability issues are being reviewed. In particular, the clear need for digitalization and low-carbon development becomes increasingly obvious. Given this, the main objectives of this article are to analyze the anti-crisis policy proposals of influential international actors and to analyze the reflection of these proposals in the recovery programmes already approved by governments. These tasks are of particular relevance for Russia, since Russia lags significantly behind other countries in the localization and implementation of the SDGs and in the sphere of low-carbon development. Ignoring these aspects during the implementation of anti-crisis policies can increase this gap. The aim of this article is to develop recommendations for anti-crisis measures based on international experience.

This article draws on content analysis of the main global proposals to combat the consequences of the COVID-19 crisis and already approved anti-crisis programmes, as well as elements of comparative analysis.

## Digitalization and the Green Sector in Sustainable Development

Among the many sectors of the modern economy, digital technologies and the green sector play a special role in sustainable development. It is rather difficult to give precise definitions for these actively developing sectors. According to the IMF, digitalization encompasses a wide range of new ways to apply information technologies to business models and products that are transforming economies and social connections. By “digital sector,” the IMF means information and communication products and services, online platforms and the activities on these platforms (for example sharing economy) [IMF, 2018]. According to the UN Environmental Programme (UNEP), a green economy can improve well-being and social equity while significantly reducing environmental risks. In its simplest definition, the green economy is low-carbon, resource efficient and socially inclusive [UNEP, 2011]. Thus, the green sector can comprise energy efficient technologies, renewable energy sources, elements of a circular economy, sustainable agriculture, sustainable forest management and so on.

These two sectors are the basis of the most important economic transformations of our time: digitalization is the foundation of the fourth industrial revolution, and the green sector is a key element of the green industrial revolution. Moreover, they play an important integrating role between the three key areas of sustainable development. The digital economy reconciles economic and social development by making government services as well as public goods (education, health care) more accessible, making it easier to create new companies, jobs and added value. The green economy reconciles economic and environmental development, allowing economic growth while reducing environmental damage through the use of renewable energy technologies, sustainable agriculture, environmentally friendly materials and circular economy mechanisms.

Digital and green sectors are mutually important. Digital technologies make the green sector more efficient and reliable and are helping to save energy. In the future, digital energy systems will be able to identify which consumers need energy and deliver it at the right time and at the lowest costs. In their turn, data centres are already the largest energy consumers – they account for about 1% of total global electricity demand. Thus, energy efficiency and the ability to use renewable energy sources is becoming increasingly important for digital sector.

Progress in digital and green sectors is fundamentally reshaping economic activity and business-as-usual models and creating opportunities for balanced economic, social and environmental development consistent with the concept of sustainable development. Further, digitalization and green development affect almost every SDG, and their spread is possible with the implementation of each of the goals.

Digitalization plays a special role in the SDGs' implementation. The 2030 Agenda is largely based on data governance. The document emphasizes the importance of the availability of "high quality, relevant and reliable data, disaggregated by income, gender, age, race, nationality, migration status, disability, geographic location and other characteristics that are relevant to national conditions." Such complex data system management is impossible without the use of modern digital technologies.

Moreover, digitalization expands opportunities to localize the SDGs. For example, the introduction of e-government with electronic transactions improves the quality of public services and their availability, as well as the interaction between the state and business and the overall efficiency of public administration. In many cases, this leads to a decrease in corruption and an increase in transparency and therefore contributes to the achievement of SDG 16 ("peace, justice and strong institutions") [ElMassah, Mohieldin, 2020]. According to T. Janowski [2016], e-government plays a key role in the implementation of the SDGs, and most of the 2030 Agenda targets require digitalization opportunities. It is noteworthy that, according to Janowski's findings, most European Union (EU) countries do not have the necessary digitalization competencies to implement the 2030 Agenda. This means that the global potential of the digital sector in sustainable development is far from being achieved.

The pandemic has caused a variety of experiments. It has changed the way of life of millions of people, their daily communications, working hours and migration patterns. Remote work has become a new normal. Online shopping has skyrocketed. Various services such as consultations, sports and education have moved to the online realm. Countries with developed digital sectors turned out to be more prepared for the pandemic's challenges and were able to transfer many economic activities online in a short time. Even if life returns to its usual format after the pandemic, these trends will not go unnoticed and will affect the further global development.

## Key Proposals for Anti-Crisis Policies

A large number of reports and studies on the COVID-19 crisis aimed at developing anti-crisis policies predict dramatic consequences for the global economy, including a significant reduction in well-being for most of the global population. The world is facing the deepest economic crisis in its post-war history. Thus, according to the June report of the International Labour Organization (ILO), in the second quarter of 2020 alone, the number of working hours in the world decreased by 14%, which is equivalent to the loss of 400 million jobs [ILO, 2020]. This means that the consequences of the crisis may be worse than the pandemic itself.

Many international organizations, corporations and representatives of government bodies suggest not only support for business but also adherence to international agreements related to the SDGs' implementation and climate action. A review of the anti-crisis proposals of the world's leading organizations from 15 March to 31 July 2020 shows that more than 20 proposals were collected in 4.5 months, which are presented below (Table 1). All significant proposals from reputable organizations or individuals were collected without taking into account whether they are related to digitalization, the green sector or sustainable development in general.

The Club of Rome urged world leaders not to respond to the current crisis with short-sighted decisions, which can increase emissions and have a negative impact on the environment in the long term. The letter also notes that anti-crisis measures should not focus on grants – they should include strong economic incentives which could help companies and industries move to low-carbon circular business models.

Table 1. Key Global Anti-Crisis Proposals, 1 April – 31 July 2020, in Chronological Order

No.	Organization	Key Proposals	Expenses	Date
1	IEA [Biroi, 2020]	Clean energy should become a key element of anti-crisis programmes: governments can use the current situation to strengthen their climate ambitions, as well as to take anti-crisis measures that promote clean energy technologies	No assessment	14 March
2	The Stay Grounded Network [2020] (160 trade unions, NGOs etc., that require reducing CO2 emissions from aviation)	Support should not be given to shareholders, top managers or airlines, but measures must be taken to achieve a just and ecological transition. It is important to help aviation workers get trained and find climate-friendly jobs	No assessment	18 March
3	UN [2020]	<ul style="list-style-type: none"> <li>· To support not only corporations, but also households and small and medium enterprises;</li> <li>· To cancel protectionist measures in international trade (especially in medicines);</li> <li>· To support developing countries (i.e. through debt relief);</li> <li>· To coordinate the actions of central banks;</li> <li>· To waive sanctions in the time of solidarity;</li> <li>· To maintain previously agreed development priorities (Agenda 2030 and the Paris Agreement)</li> </ul>	At least 10% of global GDP	19 March
4	Club of Rome [2020]	Global leaders must support investment in people, nature and low-carbon development: <ul style="list-style-type: none"> <li>· Renewables instead of fossil fuels;</li> <li>· Environmental protection and forest restoration;</li> <li>· Sustainable food production systems and sustainable agriculture;</li> <li>· Support for local, circular and low-carbon economies</li> </ul>	No assessment	26 March
5	A group of European companies and investors in the energy efficiency sector [European Alliance to Save Energy, 2020]	A message to the EU leaders: Europe's ambition to become the first climate-neutral continent will drive the creation of a sustainable and inclusive EU economy. The European Green Deal has the potential to stimulate economic transition and job creation in sectors such as construction, transportation, energy, agriculture and manufacturing	No assessment	6 April
6	Seventeen climate and environment ministers from the EU [European Climate and Environment Ministers, 2020]	The EU Green New Deal should become a key element of sustainable recovery from the COVID-19 pandemic. EU countries should increase their investment in: <ul style="list-style-type: none"> <li>· Environmentally sustainable transport systems;</li> <li>· Renewable energy sources;</li> <li>· Building renovations;</li> <li>· Research and innovations;</li> <li>· Biodiversity restoration;</li> <li>· Circular economy</li> </ul>	No assessment	9 April

No.	Organization	Key Proposals	Expenses	Date
7	350.org [350, 2020] and 500 NGOs from different countries	Five principles of anti-crisis policy are proposed: <ul style="list-style-type: none"> <li>• To put people's health first;</li> <li>• To provide economic relief directly to people;</li> <li>• To support employees and communities, not leaders;</li> <li>• To build resilience to future crises;</li> <li>• To maintain solidarity and community and oppose autocracy</li> </ul>	No assessment	9 April
8	One hundred and eighty EU decision makers from corporations, business-associations, NGOs, etc. [Various Signatories, 2020]	Post-crisis recovery provides an opportunity to create a new model of prosperity. Moving to a climate-neutral economy, protecting biodiversity and transforming food production systems can create new jobs, promote economic growth and improve the quality of life for all people. Green recovery investment programmes need to be implemented	No assessment	14 April
9	Eighty-three billionaires [Millionaires for Humanity, 2020]	Taxes on wealthy people must be raised	No assessment	30 April
10	A group of researchers, including Joseph Stiglitz, the winner of the 2001 Nobel Prize in Economics [Hepburn et al., 2020]	Measures are proposed that will have a positive impact on both economic recovery and climatic indicators: <ul style="list-style-type: none"> <li>• To develop green physical infrastructure;</li> <li>• To improve the resource efficiency of buildings;</li> <li>• To educate and train workers who will be affected by COVID-19 pandemic staff reductions, as well as by structural unemployment associated with decarbonization;</li> <li>• To invest in natural capital, sustainability and restoration of ecosystems;</li> <li>• Research and development expenditure in green industries</li> </ul>	No assessment	4 May
11	C40 cities' mayors [C40 Cities, 2020]	The post-crisis recovery should increase the resilience of cities and communities. It is necessary to invest in preventing future threats, including climate crisis, and to provide support for people most exposed to climate and health risks. Climate action can accelerate economic recovery and enhance social justice through the use of new technologies and new industries as well as through new jobs creation	No assessment	7 May
12	World Health Organization (WHO) [2020]	Recommendations for a healthy and green recovery after pandemic: <ul style="list-style-type: none"> <li>• To protect nature – this is the basis for human health;</li> <li>• To invest in basic services, from clean water and sanitation to clean energy in healthcare facilities;</li> <li>• To ensure a fast energy transition;</li> <li>• To support sustainable food systems;</li> <li>• To develop healthy and livable cities</li> </ul>	No assessment	26 May



No.	Organization	Key Proposals	Expenses	Date
13	More than 350 organizations, with more than 40 million healthcare workers and more than 4,500 independent health-care workers from 90 countries [Various Health Professionals, 2020]	Address to G20 Leaders: Smarter incentives and disincentives need to be used for a healthier and more sustainable society. If governments reformed fossil fuel subsidies and redirected most of them to clean renewable energy, our air would be cleaner, our emissions would be significantly reduced and economic growth would be positive	No assessment	26 May
14	IEA and IMF [IEA, 2020b]	Global Energy Recovery Plan: <ul style="list-style-type: none"> <li>• Investments in renewable energy supplies;</li> <li>• Electrification of transport, development of public transport;</li> <li>• Renovation of buildings (improving energy efficiency);</li> <li>• Cancellation of fossil fuel subsidies</li> </ul>	\$3 trillion for three years (<1% of global GDP per year)	June
15	More than 200 UK corporations, investors and business associations [Various Corporate Leaders, 2020]	Address to the British prime minister: A clean and just recovery of the British economy is needed. Investment in industries such as building renovation, offshore wind energy, electric transport, environmental protection and low-carbon industrial clusters can create new quality jobs in the UK regions. The recovery measures should be used to accelerate the transition to zero net emissions	No assessment	1 June
16	Current and former heads of the central banks of the EU countries [Bailey, 2020]	Renewable energy investment can pursue two goals: energy transition and creation of new jobs to support the economy. A green economic recovery is needed	No assessment	5 June
17	A group of 178 investors [Various Investors, 2020]	Recommendations to EU leaders on anti-crisis policies: <ul style="list-style-type: none"> <li>• Support people and create new jobs through investment in low-carbon energy, industrial and transportation systems, climate resilience and infrastructure;</li> <li>• Support for the EU Green Deal and the Paris Agreement;</li> <li>• Reduce climate risks through anti-crisis measures;</li> <li>• Emphasize climate resilience and economic solutions with zero net emissions;</li> <li>• Engage investors in recovery planning.</li> </ul>	No assessment	9 June
18	European Youth Forum (a platform for youth organizations) [Autengruber, 2020]	Address to the EU leaders: Recovery measures should prioritize SGDs and the 2030 Agenda	No assessment	19 June

No.	Organization	Key Proposals	Expenses	Date
19	International Renewable Energy Agency (IRENA) [2020]	<p>Key areas for investment in the economic recovery:</p> <ul style="list-style-type: none"> <li>• Green hydrogen and electrification;</li> <li>• Renewable energy supplies in power generation;</li> <li>• Energy storage devices;</li> <li>• Smart grids</li> </ul>	\$2 trillion for 2021–23	24 June
20	Thirteen civil aviation organizations, including the International Air Transport Association [Various Civil Aviation Organizations, 2020]	<p>Civil aviation has been severely hit by the COVID-19 crisis. The industry finds it difficult to invest in climate action on time, so government support for decarbonization is needed:</p> <ul style="list-style-type: none"> <li>• Support production and consumption of sustainable aviation fuel;</li> <li>• Stimulate the renewal of aircraft fleets;</li> <li>• Increase funding for research and innovation;</li> <li>• Invest in air traffic management (digitalization);</li> <li>• Improve the resilience of airports and helpouts</li> </ul>	No assessment	24 June
21	Two hundred and thirty-five Canadian organizations that specialize in environmental protection [Various Canadian Environmental Organizations, 2020]	<p>Investment in biodiversity can create new jobs and be an important part of economic recovery. Investment can also be channelled to planting forests, restoring ecosystems, improving forest management, establishing sustainable fish farming and sustainable agriculture</p>	No assessment	10 July
22	A group of U.S. corporations [Various U.S. Corporations, 2020]	<p>The U.S. needs to support green energy:</p> <ul style="list-style-type: none"> <li>• To increase the flexibility of grids and integrate variable generation;</li> <li>• To invest in infrastructure and grid modernization;</li> <li>• To ensure the creation of new jobs in green energy;</li> <li>• To stimulate transport electrification;</li> <li>• To encourage increased energy efficiency</li> </ul>	No assessment	21 July

*Source:* Compiled by the authors using open sources.

Some proposals are surprising for their content and the power of reasoning. On 21 July 2020, American companies and American branches of foreign and multinational corporations such as Nestle, Unilever, PepsiCo, McDonald's Corporation and others – the largest consumers of energy in the country – published a letter to the U.S. Congress asking it to support green energy (Table 1). Thus, corporations that employ millions of Americans and are not related to the energy sector see the way out of the healthcare crisis as being through investment in green energy. In their letter, they argue that money invested in clean energy creates about three times more jobs than money invested in fossil fuels, for every dollar spent. Similar jobs figures are contained in the proposal of the International Renewable Energy Agency (IRENA): each \$1 million investment creates three times more jobs in renewable energy than in traditional energy [IRENA, 2020].

This is not the only example of large businesses advocating a commitment to sustainable development and green sectors during the pandemic. Earlier, in April 2020, 68 German corporations – including representatives of a wide range of industries from financial services to the construction sector and heavy industry – published a letter urging the government to address the crisis by supporting green industries and taking action to implement the Paris Agreement. More than 200 UK corporations and a group of European companies and energy efficiency investors made similar calls.

Another surprising announcement was the appeal of 83 millionaires, including Abigail Disney, the great-granddaughter of the Walt Disney Company's co-founder, to increase taxes on the wealthiest citizens in order to raise funds to combat the consequences of the pandemic. Millionaires noted in their open letter that it is government taxation, not charity, that can contribute to solving the problem.

Another interesting proposal was prepared by 235 Canadian environmental organizations, which suggested that the crisis can be surmounted by investing in the conservation and restoration of biodiversity. These investments can create new jobs, including those in the regions, and improve the environmental and social situation.

It is important to mention the statement by medical personnel from 90 countries (Table 1). In May, more than 350 organizations representing more than 40 million healthcare workers and more than 4,500 individual healthcare professionals issued an open letter urging Group of 20 (G20) leaders to consult with their chief health officers and scientific advisers when developing anti-crisis incentives. They also argued that the impact of these measures on the health of the population in the long term should be assessed. In addition, the group of doctors called for the cancellation of fossil fuel subsidies and channelling the freed funds to renewable energy to reduce emissions and improve public health. On the same day, the World Health Organization made a similar statement.

The European aviation sector supports the European Commission's approach which combines economic recovery and transition toward sustainable development. At the same time, the need to support the aviation industry in the sphere of decarbonization and digitalization is noted, as the industry has been badly affected by the crisis. Stimulation of sustainable fuel production, funding for research and innovation in clean aviation, and introduction of new digital technologies at airports and for air navigation is required.

An important feature of anti-crisis proposals is the requirement to place individuals, communities and small and medium businesses at the centre of economic recovery programmes. Such proposals usually have come from the non-profit sector.

A paper by a group of renowned scholars including Joseph Stiglitz, 2001 Nobel laureate in economics and professor at Columbia University [Hepburn et al., 2020], had a major impact on current anti-crisis ideas. In order to identify incentive policies that are likely to produce good results in terms of both economic recovery and climate change mitigation, they conducted a

survey of 231 representatives of central banks, ministries of finance and other experts from the G20 countries. This resulted in the identification of five areas in which investment should be made to combat the economic consequences of the COVID-19 crisis. These areas are listed in No. 10 in Table 1, of which four are directly related to the green economy.

As is clear from the above analysis, many proposals for anti-crisis policies contain calls for support of the development of renewable energy sources. At the same time, it is important to note the following: even if countries do not take any action to stimulate renewables, this sector will be one of the few that will demonstrate positive growth by the end of 2020. One of the documents reviewed – the Global Energy Recovery Plan, published by IEA and IMF in June 2020, contains the following global forecasts for the energy sector for 2020: oil demand will decrease by 8%, gas demand by 4%, coal demand by 8%, the volume of nuclear electricity production will drop by 2.5%, the demand for electricity will drop by 5% (in some regions by 10%) and the volume of electricity production from renewable energy sources will increase by 5%.

The positive forecasts for the renewable energy source (RES) sector contrasted with the negative dynamics of the energy sector as a whole are explained by three factors. First, at the moment renewable energy generation provides significant economic benefits compared to fossil fuels generation. In recent years, renewable energy has become much cheaper, and wind and sun are the cheapest energy sources in the world [Lazard, 2019]. Renewable energy sources also have low operating costs, and the low demand for electricity gives them an additional economic advantage. Second, in many countries, renewable energy power plants have priority access to the grid. Third, a large number of new renewable energy facilities have recently been commissioned, and many new RES power plants will be built by the end of 2020, despite the lockdown.

The digital economy is also one of the few sectors that, without any government support measures, has shown growth during the pandemic. This study shows that in most of the anti-crisis policy proposals digitalization itself is not proposed as an independent tool in the fight against the pandemic's consequences, but it is highly important in the restoration and greening of the economy, as noted in many documents. Thus, digitalization should be considered one of the original solutions to the unusual global economic crisis of 2020, not alone but together with climate solutions such as circular economy transition, low-carbon production and sustainable agriculture, and a transition to green energy. In other words, digitalization can increase the green sector's efficiency and reduce emissions, which in turn will contribute to the creation of new industries, companies and jobs and restore the economy in a completely different form. However, at the moment digitalization does not have the potential to become a key idea for anti-crisis policies.

At the same time, it is important to note that the green transformation of the economy and transition to sustainable development are long-term tasks, and their implementation may contradict some of the short-term anti-crisis policies. Therefore, especially during the first year of the crisis, it may be difficult for governments to focus on green industries given the need to manage the acute phase of the crisis and normalize economic life.

## Early Recovery Programmes for the World's Leading Economies

The exact scope of post-pandemic global recovery programmes remains difficult to estimate. Different sources give quite different estimates, and the data are constantly updated. In June 2020, the IEA and the IMF estimated that the value of global anti-crisis programmes would be about \$9 trillion, while Bloomberg set this at about \$12 trillion; less than 0.2% of this sum was expected to be allocated between green sectors [Evans, Gabbatiss, 2020]. According to Vivid Economics estimates made at the end of July 2020, the size of global anti-crisis programmes reached \$11.8 trillion [Vivid Economics, 2020]. The report noted that 17 largest economies

intended to spend about \$3.5 trillion to combat the consequences of the pandemic, and environmentally hazardous industries received more support than green sectors in 14 of them.

Data has been collected for early anti-crisis recovery programmes (as of August 2020) in 10 leading economies (Table 2). This data shows that by August 2020, most countries had only taken emergency post-crisis recovery measures, mainly in line with their usual anti-crisis policies. In particular, countries sought to support demand and provide short-term assistance to their populations, as well as to small and medium enterprises. Many of the largest polluters have weakened environmental standards, effectively allowing their factories to increase emissions. A similar situation was observed after the global crisis of 2008–09. At that time, the U.S. government first provided \$700 billion in support to the banking sector. Then, a few months later, a decision was made on an additional package of anti-crisis measures in the amount of \$800 billion, of which \$80 billion was spent on reducing greenhouse gas emissions, improving energy efficiency and technological innovation [Bloomberg, 2020]. This gives hope that the recommendations of the international community will be heard by governments and transformed into real actions, and the scale of support to the green sector this time will be more significant than after the crisis of 2008–09.

Table 2. Anti-Crisis Programmes of the Top-10 Economies by GDP, August 2020<sup>2</sup>

No.	Country	The Main Measures of Anti-Crisis Programmes
1	<b>China</b> \$592 billion	<ul style="list-style-type: none"> <li>· Credit line extensions for state-owned enterprises;</li> <li>· Infrastructure projects, including green ones;</li> <li>· Deregulation of environmental standards;</li> <li>· Subsidies and tax breaks for environmentally harmful industries, as well as for green projects;</li> <li>· Environmental protection projects</li> </ul>
2	<b>U.S.</b> \$2.98 trillion	<ul style="list-style-type: none"> <li>· Payments to the population;</li> <li>· Small and medium business support;</li> <li>· Economic stabilization and assistance to the struggling sectors of the economy;</li> <li>· Expanding credit availability;</li> <li>· Assistance to airlines and strategically important enterprises;</li> <li>· Deregulation of environmental standards;</li> <li>· Subsidies for research and development in the green sector</li> </ul>
3	<b>India</b> \$266 billion	<ul style="list-style-type: none"> <li>· Payments to the population;</li> <li>· Small and medium business support;</li> <li>· Infrastructure projects, including green ones;</li> <li>· Deregulation of environmental standards;</li> <li>· Subsidies and tax breaks for green product producers</li> </ul>
4	<b>Japan</b> \$2.17 trillion	<ul style="list-style-type: none"> <li>· Payments to the population;</li> <li>· Support for large companies (airlines, car manufacturers);</li> <li>· Small and medium business support;</li> <li>· Green infrastructure projects</li> </ul>
5	<b>Germany</b> \$1.38 trillion	<ul style="list-style-type: none"> <li>· Payments to the population;</li> <li>· Support for the most affected companies;</li> <li>· Small and medium business support;</li> <li>· Support for national exports;</li> <li>· Expanding the credit availability;</li> <li>· Green infrastructure projects;</li> <li>· Subsidies for research and development in the green sector;</li> <li>· Subsidies and tax breaks for green product manufacturers</li> </ul>

<sup>2</sup> GDP, PPP (constant 2018 international \$).

6	<b>Russia</b> \$56 billion	<ul style="list-style-type: none"> <li>· Payments to the population;</li> <li>· Small and medium business support;</li> <li>· Support of environmentally hazardous industries</li> </ul>
7	<b>Brazil</b> \$221 billion	<ul style="list-style-type: none"> <li>· Support for the most vulnerable social groups, informal and self-employed workers;</li> <li>· Small and medium business support;</li> <li>· Support for industry and transport</li> <li>· Deregulation of environmental standards;</li> <li>· Green infrastructure projects;</li> <li>· Subsidies and tax breaks for green product manufacturers</li> </ul>
8	<b>Indonesia</b> \$46 billion	<ul style="list-style-type: none"> <li>· Support for the most vulnerable social groups;</li> <li>· Small and medium business support;</li> <li>· Deregulation of environmental standards;</li> <li>· Green infrastructure projects;</li> <li>· Green research and development subsidies;</li> <li>· Subsidies and tax breaks for the green products manufacturers</li> </ul>
9	<b>UK</b> \$630 billion	<ul style="list-style-type: none"> <li>· Payments to the population;</li> <li>· Support for the most affected companies;</li> <li>· Small and medium business support;</li> <li>· Deregulation of environmental standards;</li> <li>· Green infrastructure projects;</li> <li>· Green research and development subsidies;</li> <li>· Environmental protection projects.</li> </ul>
10	<b>France</b> \$469 billion	<ul style="list-style-type: none"> <li>· Support for the most affected companies;</li> <li>· Transport sector support;</li> <li>· Deregulation of environmental standards;</li> <li>· Green infrastructure projects</li> <li>· Green research and development subsidies;</li> <li>· Subsidies and tax breaks for green product manufacturers</li> </ul>

*Source:* Compiled by the authors based on Vivid Economics [2020] and other open sources.

So far, only the EU has demonstrated a real intention to significantly support the green sector in pursuing its anti-crisis policies. A quarter of the EU's anti-crisis spending, 850 billion euros in total, will go toward fighting climate change. In particular, measures will be taken to reduce dependence on fossil fuels, improve energy efficiency, preserve and restore natural capital and so on. In addition, all recovery loans and grants for EU members will contain the condition that environmental damage must be avoided.

Among the national anti-crisis plans, the German economic recovery plan totaling 130 billion euros is the most focused on green initiatives so far. The plan is for 2020–21. But even in this package only about 60 billion euros will be allocated to the green sector of the economy, which is less than half of the entire programme. These funds will be used to develop public transport, hydrogen energy, electric vehicles and renewable energy. The total announced spending on anti-crisis measures in Germany has already reached \$1.38 trillion (Table 2). Some measures aimed at green sector support will be taken in the UK and France, but these costs are much lower than in Germany. For example, in the UK they would comprise only \$445 million.

Korea may implement a programme similar to the European Green Deal. The country's leaders announced such plans after the victory of the Democratic Party in the elections to the National Assembly in April 2020. Korea's Green Deal could also include a goal of zero net emissions by 2050. Achieving this goal will make Korea the first carbon-neutral country in

Asia. It is expected that in the near future this intention will have a significant impact on the anti-crisis policies of Korea.

According to Energy Policy Tracker, by early August 2020, G20 countries had committed more funds to support fossil fuel industries than to support clean energy as part of their anti-crisis programmes. An important exception is China, which will spend four times more on renewables than on fossil fuels. The United States will provide more benefits to traditional energy (Fig. 1). In total, the 20 largest economies in the world will allocate at least \$169 billion to support the energy sector, of which 47% is for fossil fuels and 39% for clean energy. Fostering the energy sector will be carried out through direct budgetary spending, tax breaks, soft loans, loan guarantees and so on.

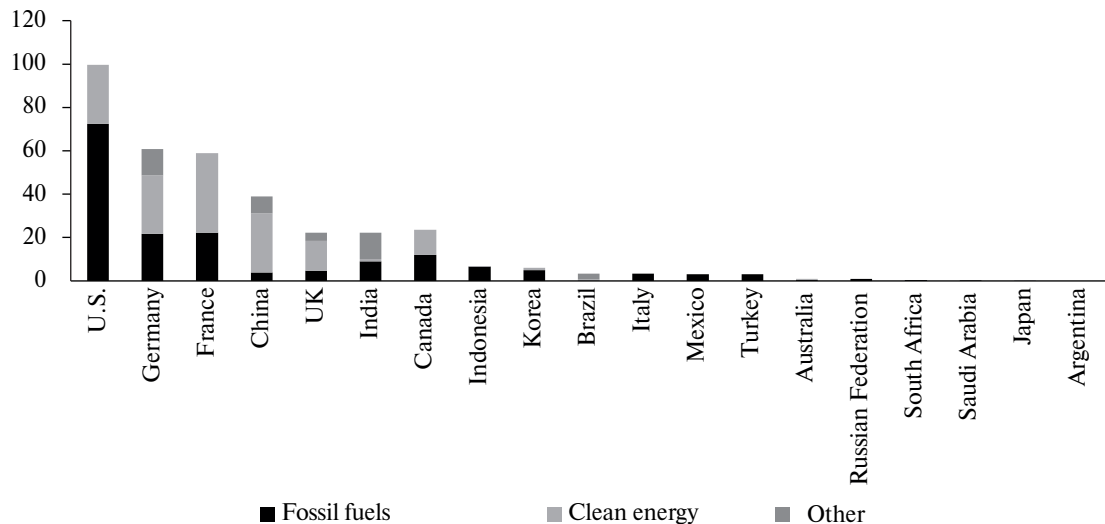


Fig. 1. The Energy Sector's Support in G20 Countries as a Part of Economic Recovery Programmes After the COVID-19 Pandemic, as of Early August 2020.

Source: [Energy Policy Tracker, 2020].

Thus, the real policies of the world's largest economies are not yet aimed at green recovery, nor at changing the economic paradigm. The measures taken and announced by governments in the first four months of the pandemic do not correspond to the principles of sustainable development and the goals of the Paris Agreement. They represent the business-as-usual paradigm. However, given the unprecedented consensus of the world community that the way out of the COVID-19 crisis should be green, there is hope that after the end of the acute phase of the crisis a second round of anti-crisis programmes will be aimed at a longer period and focused on the green sector of economy.

In the existing anti-crisis measures of the largest world economies digitalization is hardly mentioned separately, although it is already obvious that the digital sector of the economy has played a huge role in mitigating the economic crisis, creating opportunities for remote work and learning. It is also obvious that digitalization should be supported in emerging market countries in which underdeveloped digital infrastructure prevents the transfer of economic processes online, as was done in high-income countries.

## Sustainable Development in a Pandemic: The Russian Context

The terminology of sustainable development in general and the SDGs in particular has not yet been integrated into strategic documents in Russia. The sustainable development strategy in Russia has not been adopted. Even in the decree adopted in May 2018 [President of the Russian Federation, 2018], there were no references to the SDGs, although it is believed that this decree localized SDGs in Russia through the system of national projects. Thematically, many national projects directly or indirectly take into account some SDGs, but there is no direct mention of sustainable development goals. In addition, in the texts of national projects, there is not a word about sustainability as it is. The common terminology developed within the framework of the concept of sustainable development is not used, while Russia must use generally accepted concepts in order to act in line with its obligations.

For the implementation of national projects, special coordinating bodies were created, responsible ministers were appointed and the expected results of national projects were formulated in the form of quantitative goals – all this in general corresponds to world practices to implement the SDGs. At the same time, the connection of national projects with the SDGs is conditional; they are focused primarily on the implementation of goals and objectives of domestic policy, relevant even before the adoption of 2030 Agenda: education, health care and economic growth. The environmental aspect of the SDGs was not reflected in the national goals, and important aspects of the 2030 Agenda such as gender equality and human rights protection were not taken into account. In addition, national targets have been developed for the period up to 2024.

In July 2020, due to the COVID-19 pandemic, the deadline for the implementation of national projects was postponed from 2024 to 2030. A new decree was also issued, and the adjusted national goals until 2030 were announced: preservation of the population, health and well-being of people; opportunities for self-realization and development of talent; comfortable and safe living environment; decent, efficient work and successful entrepreneurship; and digital transformation. These goals also overlap with the SDGs but are still not formally linked to them. Environmental aspects are taken into account within the framework of the national goal “comfortable and safe environment for life,” which provides for the creation of a sustainable system for handling solid municipal waste, reducing emissions of hazardous pollutants, eliminating the most dangerous objects of accumulated environmental damage and ecological improvement of water bodies.

The actual implementation of the SDGs is not declared as a national priority; therefore, there is no body coordinating the implementation of the SDGs in the management system. Abroad, Russia is represented by the Ministry of Foreign Affairs and the Ministry of Economic Development of Russia. Partially, the Interdepartmental Working Group under the Presidential Administration of the Russian Federation on issues related to climate change partially implements the powers of the SDGs’ coordinating body, but the 2030 Agenda is much broader than climate problems. In other countries, these coordination duties are performed directly by ministries within the executive branch or by prime ministers.

At the same time, as noted in the bulletin of the Accounting Chamber of the Russian Federation [2020], individual federal executive authorities acknowledge that their activities contribute to the implementation of the SDGs; however, unlike in foreign countries, their work on SDGs is proactive since Russia does not have a national strategy for the SDGs’ implementation. No one is responsible for the comprehensive implementation of the SDGs in Russia.

To improve the efficiency of implementing the SDGs in Russia, it is necessary to: normatively consolidate the generally recognized understanding of sustainability abroad; institution-



alize the concept of sustainable development at the state level by developing a national strategy for sustainable development and thus integrating the 2030 Agenda into strategic planning documents as well as by identifying a responsible agency; and organize efficient interagency cooperation. Russia has its own set of development priorities, but it should be more closely correlated with the sustainable development goals.

The COVID-19 pandemic has forced many governments to reconsider their priorities. For the first time in recent years, social goals (people's health and lives) were recognized as more important than economic ones: quarantines and self-isolation regimes were introduced and borders were closed despite the significant suspension of the service sector, tourism business, and the plight of small- and medium-sized enterprises. Under these conditions, the EU continued to work on the implementation of the European Green Deal approved at the end of 2019.

In Russia, green technologies and principles of sustainable development are not yet considered as a possible basis for post-crisis recovery. This state of affairs is a serious omission of the Russian economic policy, since as follows from the above analysis the world community has been calling on global leaders to support green industries from the very beginning of the pandemic, and this will most likely be implemented within the framework of the second wave of anti-crisis programmes. Russia runs the risk of being left out of this important trend, once again missing the opportunity to diversify its economy and lagging behind other countries in the development of new industries.

## Conclusion

This article contains a content analysis of more than 20 proposals of international organizations, corporations, representatives of the academic sector and even government authorities regarding global, regional and national anti-crisis policies. The main demand of the international community, which is clearly expressed in almost all the proposals reviewed, is the demand to carry out economic recovery after the pandemic by solving the climate and environmental crises and supporting green industries. Many proposals also note the exceptional role of the digital sector of the economy, as it allowed the world to minimize the negative economic consequences of the pandemic in the short term through the partial or complete transition of most processes online in corporations, universities and schools. They also emphasize the importance of inclusiveness and fairness while overcoming the crisis and the need to place individuals and communities, not corporations, at the centre of recovery policies.

These proposals do not directly correspond to the anti-crisis measures taken before August 2020. Support measures already implemented or announced by the governments of the world's largest economies included some incentives to develop green infrastructure, renewable energy and energy efficiency. However, their scale is very small compared to the traditional anti-crisis measures, which include demand support, first aid assistance to the most affected industries, often imposing extremely negative impact on the environment, large corporations, and so on. Thus, the real anti-crisis economic policy is still far from the international community's requirements. Governments take measures aimed at preserving the trends that were observed before the pandemic – in particular, stimulating the traditional energy sector. Moreover, many major polluters have relaxed environmental requirements. This will slow the recovery and exacerbate environmental and climate problems. Digitalization is also largely unmentioned in the anti-crisis programmes.

Based on this analysis, support for the following in national anti-crisis programmes is recommended:

- Clean energy and transport electrification;
- Circular economy and reducing the negative impact of industrial enterprises on the environment;
- Accelerated digitalization and partial transition to the online mode on an ongoing basis in those organizations that do not require the daily presence of employees at their workplaces;
- Protection and restoration of natural ecosystems.

Since many countries have managed to take only emergency anti-crisis measures so far, there is a chance that during the second wave, governments will have more opportunities to assess the long-term consequences of the crisis, and these recommendations will be fully or at least partially taken into account.

These recommendations are also relevant for Russia. On the whole, Russia's domestic policies are not yet focused on sustainable development. In Russia, no work has been carried out to localize the SDGs, a system for their implementation has not been formed, and only certain areas of internal socio-economic policies overlap with particular sustainable development goals. Russian anti-crisis packages do not include measures to support green sectors. At the same time, given the depth of the crisis and the obvious focus of the world community on a green economic recovery, Russia needs to pay attention to green industries and the circular economy. Otherwise, there is a risk of Russia's being more and more left behind.

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# The Digital Divide in Developing Countries<sup>1</sup>

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## Abstract

*Poverty has been a critical issue for a long time and continues to affect developing countries in the era of booming digitalization. This study investigates the contribution of digitalization to poverty alleviation, confirming that it can promote economic growth. However, utilizing a sample of 37 developing countries in 2014 and 2016, this study observes that the extremely poor are deprived of their share of the benefits that digitalization can offer. Therefore, while strategies to further promote digitalization are critical to economic development, support systems or policies meant to bring those in extreme poverty into mainstream development are badly needed.*

**Key words:** digitalization; poverty; developing countries

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## Introduction

At the moment, digital transformation is a significant trend, with almost all sectors experiencing transition.<sup>2</sup> Digital transformation is particularly crucial to the shift from the first industrial revolution to the recent fourth industrial revolution [Schwab, 2016]. In summary, the first industrial revolution focused on water and steam power to mechanize production, followed by the electric power-based second revolution and later by the electronic and information technology-based third revolution in the middle of the last century. Building on the third industrial revolu-

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<sup>1</sup> The editorial board received the article in August 2020.

<sup>2</sup> The most basic definition of digitalization refers to the use of digital technologies to generate income, value-producing opportunities, improve business processes and create a digital business environment [Rachinger et al., 2019]. Therefore, digitalization is the fundamental aspect of the digital transformation because it can affect society in terms of employment, incomes, inequality and health resource efficiency and eventually build a better future. Relatively close to digitalization, digitization refers to the transformation of analog to digital. For instance, Cisco has described digitization as the link between individuals, processes, information and data that provides information and knowledge that improves business outcomes [Schallmo, Williams, 2018].

tion, the fourth industrial revolution has emerged and is exponentially expanding. According to K. Schwab [2016], the fourth industrial revolution is characterized by a fusion of technologies that is blurring the line between the physical, digital and biological spheres, while disrupting almost every industry in every country.

This ongoing wave of digitalization is theoretically predicted to improve socio-economic status across countries, connecting people with services and jobs and building a better future. The use of digitally connected technologies, including the Internet, cloud computing, big data and fintech, by enterprises, government and consumers for digital storage, analysis and sharing of information promotes economic growth, productivity, innovation and employment. The World Bank [n. d., a] states that digital development components are now fully implemented across sectors such as transport, education, health, agriculture and public sector management and that activities across the sectors focus on five key elements: (a) digital infrastructure, (b) digital innovation and entrepreneurship, (c) digital financial services, (d) digital platform, digital literacy and skills. A combination of these five key elements helps to build strong and inclusive digital economies and ultimately results in successful digitalization. The e-agriculture project in Côte d'Ivoire, for example, made a significant contribution to increasing productivity for smallholder farmers and made it easier to disseminate essential information such as real-time crop prices [WB, n. d., a]. Digitalization in Myanmar helps the government to create the right regulatory environment and attract foreign investments, while creating jobs and improving the local IT industry. In addition, digitalization growth in Bangladesh is on the way to providing 30,000 or more jobs for Bangladeshi youth, increasing industry revenue by \$200 million and making Bangladesh more competitive [WB, n. d., a].

According to António Guterres, the United Nations (UN) secretary-general, digitalization will support and facilitate the efforts to achieve the UN Sustainable Development Goals (SDGs) by 2030 [ITU, 2019]. The view is that the SDGs, with 17 pillars addressing issues of poverty, energy, environment, science and technology, partnership and urbanization, can be achieved partly and much faster through the adoption and implementation of digital technologies. This is because emerging technologies such as big data, artificial intelligence, robotics, blockchain, Internet of Things (IoT) and additive manufacturing can change all dimensions of global economies and societies, thereby promoting progress toward the achievement of the SDGs [Ibid.]. Industry 4.0 is defined as a new technology that manages and optimizes all aspects of manufacturing processes and supply chains and has the potential to drive improvement in fields ranging from education, public services, healthcare, infrastructure and energy [Morrar, Arman, Mousa, 2017; Nagy, 2018]. Returning to Schwab [2016], it is defined as how technologies like artificial intelligence, autonomous vehicles and the IoT are merging with humans' physical lives. More importantly, technological changes are exponentially taking place and altering the way individuals, firms and governments work. Eventually, this is expected to lead to a societal transformation similar to previous industrial revolutions. Although the implication of Industry 4.0 is mainly on the level of industrialization itself, Industry 4.0 also appears to have reduced the barrier of developing countries to innovation, giving every country the opportunity to improve the quality of life, eventually reducing inequality. Moreover, in line with the fourth SDG to provide equal and accessible quality education and foster opportunities for all for life-long learning, the digital education revolution (DER) will significantly improve global access to quality education. The DER is an initiative to change teaching and learning, to prepare students and to work in a digital environment, especially for schools in Australia [ANAO Audit Report, 2011].

While digitalization has made remarkable progress, developing countries are not currently on track to end extreme poverty. For example, although the share of the population living in extreme poverty decreased from 16% in 2010 to 10% in 2015, the pace of poverty reduction is

decelerating [UN DESA et al., 2019]. Meanwhile, the United Nations [2018] has estimated that 6% of the world's population will remain in extreme poverty by 2030. Poverty across South Asia has decreased, largely driven by strong economic growth and relative macroeconomic stability, but it remains the region with the largest proportion of poor people [UN, 2019]. Over 35% of the population in South Asia, calculated against their respective national poverty lines, lives in poverty in Bangladesh and Pakistan [UN DESA et al., 2019]. As shown in Fig. 1, more than half of the world's extremely poor live in Sub-Saharan Africa, followed by South Asia, East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, and the Middle East and North Africa.

In East Asia and the Pacific, it is estimated that more than 100 million people are living on \$1.90, \$3.20 and \$5.50 a day [Ibid.]. As the numbers of people living in poverty persist in all regions, the first pillar of the SDGs, which is to end poverty, has been a prolonged failure. This study specifically investigates whether digitalization is a curse or blessing to developing countries in regard to poverty alleviation.

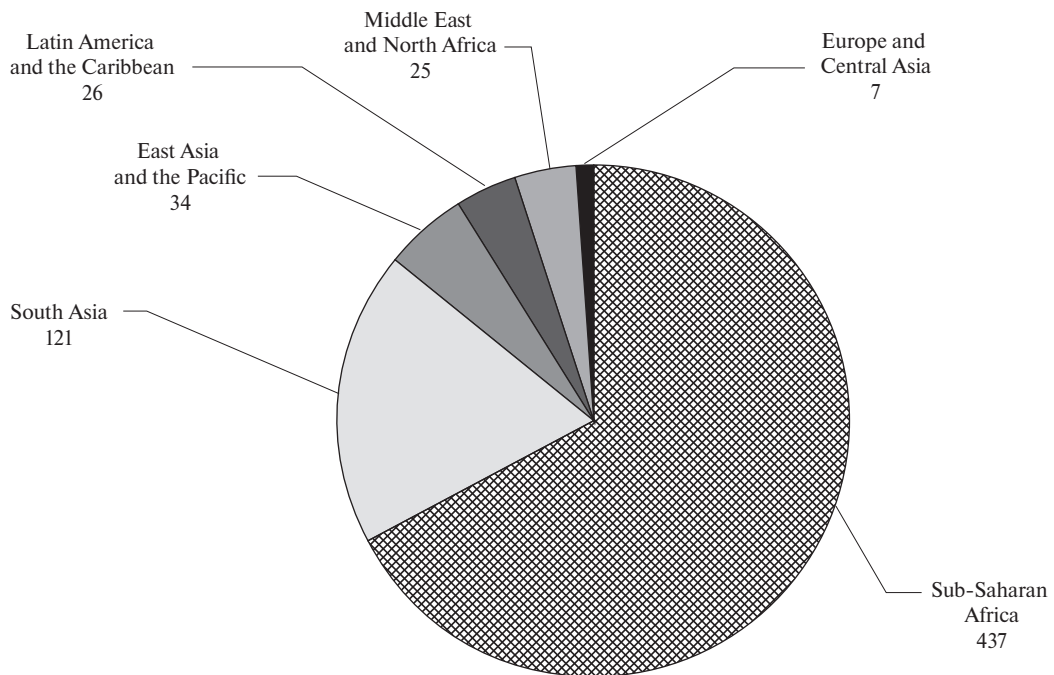


Fig. 1. Total Population Living in Extreme Poverty in 2018 (Millions)

Source: [WB, n. d., c].

## Literature Review

The relationship between income, remittance, inflation, income inequality and poverty has been thoroughly investigated in past studies. Among crucial factors of poverty are income [Adams, 1991; Adams, Page, 2005; Batabyal, Chowdhury, 2015; Bugamelli, Paterno, 2009; Gupta, Pattillo, Wagh, 2009; Kalwij, Verschoor, 2007; Kuznets, 1955; Pasinetti, 1962; Shahbaz, 2010; Tiwari, Shahbaz, Islam, 2013], remittances [Adams, Cuecuecha, 2013; Adams, Page, 2005; Akobeng, 2016; Bang, Mitra, Wunnava, 2016; Barham, Boucher, 1998; Imai, Gaiha, Kaicker, 2014; Masron, Subramaniam, 2018; Milanovic, 1987; Shen, Docquier, Rapoport, 2010; Stark



and Taylor, 1989; Taylor, 1992], inflation [Akobeng, 2016; Alam, Paramati, 2016; Cardoso, 1992; Meo et al., 2018; Ravallion, 2001; Sehrawat, Giri, 2015; Seven, Coskun, 2016] and income inequality [Adams, 2004; Hazlewood, 1978; Leow, Tan, 2019; Neaime, Gaysset, 2018; Ravallion, 1997; Sehrawat, Giri, 2018].

The impact of income, which is reflected in the inverted U-shaped Kuznets theory on poverty, is a matter of great concern in past studies.<sup>3</sup> R.H. Adams [1991], R.H. Adams and J. Page [2005], S. Batabyal and A. Chowdhury [2015], M. Bugamelli and F. Paterno [2009], S. Gupta, C.A. Pattillo and S. Wagh [2009], A. Kalwij and A. Verschoor [2007], M. Shahbaz [2010], and A.K. Tiwari, M. Shahbaz and F. Islam [2013] find that higher growth means a greater reduction in poverty, so income plays a strong role in reducing the rate of poverty. The link between economic growth and poverty operates through two channels. First, there is the link whereby economic growth increases the income of the poor and therefore, increases their ability to pay for activities and goods that can improve their health and education. More spending or investment in health and education is also strongly associated with improvement in the standard of living. High economic growth also means a substantial increase in jobs and incomes for the poor, thereby helping to reduce the income gap and disparity between the rich and the poor. Ultimately, it helps reduce the incidence of poverty.

Remittances currently constitute the highest inflows of capital to developing countries, surpassing foreign direct investment and official aid [WB, n. d., c]. Given the volume of the inflows, remittances can also be considered as another crucial factor to accelerate the reduction of poverty in recipient countries. R.H. Adams and A. Cuecuecha [2013], Adams and Page [2005], E. Akobeng [2016], J.T. Bang, A. Mitra and P.V. Wunnava [2016], B. Barham and S. Boucher [1998], K.S. Imai, R. Gaiha and N. Kaicher [2014], T. A. Masron and Y. Subramaniam [2018], B. Milanovic [1987], I.L. Shen, Docquier and H. Rapoport [2010], O. Stark et al. [1989] and J.E. Taylor [1992] show that remittances can contribute to a reduction in the level of poverty. For instance, Adams and Cuecuecha [2013] show the probability that poor households in Ghana will fall by 17% and 97%, respectively, with internal and international remittances. Likewise, Gupta, Pattillo and Wagh [2009] study the effect of remittances on poverty in a sample consisting of 24 Sub-Saharan African countries and conclude that a 10% increase in the flow of remittances is associated with a 1% reduction in poverty. Among possible explanations is that an increase in the flow of remittances raises household incomes, allows households to acquire more assets and engage in business activity, which in turn improves the standard of living and reduces poverty. To the contrary, A. de la Fuente [2010], based on a study of Mexico, suggests that the share of remittance is not associated with reducing poverty due to the absenteeism of remittance flows to the most vulnerable households in a rural area.

Meanwhile, loss of the purchasing power of money can have huge implications for the poor, and one of the main sources of reduction in purchasing power is rapid inflation. Inflation can increase transaction costs, inhibit entrepreneurship and investment and impede economic growth, resulting in an increase in the poverty level. Akobeng [2016], E. Cardoso [1992], M. Chani et al. [2011], T.T. Chaudhry and A. Chaudhry [2008], T. Fujii [2013] and M. Meo et al. [2018] support the hypothesis that an increase in inflation raises the level of poverty. Moreover, M.S. Alam and S.R. Paramati [2016], M. Sehrawat and A.K. Giri [2015] and U. Seven and Y. Coskun [2016] report that inflation erodes cash holding values and reduces people's real incomes, which then widens the gap between the rich and the poor. Subsequently, high inflation may push the poor into the poverty trap.

<sup>3</sup> Income inequality and poverty are slightly different. However, changes in the poverty level will certainly change income inequality and therefore, it is valid to replace income inequality with poverty. This conclusion is made despite the fact that the reverse causality, that is, that improvement in income inequality will also lead to reduction in poverty levels, may not necessarily be true.

There are studies that highlight the impact of income inequality on poverty, namely Adams [2004], A.K. Fosu [2015], A. Hazlewood [1978], House and Kellick [1981], H. Khemili and M. Belloumi [2018], K.W. Leow and E.C. Tan [2019], S. Neaime and I. Gaysset [2018], M. Ravallion [1997], M. Sehrawat and A.K. Giri [2018] and B. van Leeuwen and P. Földvári [2016]. These studies have typically produced homogenous findings of worsening poverty levels due to uneven income distribution. The uneven distribution of income creates fewer opportunities and resources for poor people to raise their standard of living, increasing poverty. Thus, the more unequal the income distribution, the worse off will be the poor.<sup>4</sup>

Digitalization has undergone rapid development and its applications have been in almost every sector and aspect of the economy. Digitalization has made the biggest contribution in terms of cost minimization and therefore has become vital for firms' survival and profitability as well as national productivity and income. L. Becchetti, D.A.L. Bedoya and L. Paganetto [2003], L. Becchetti and S.D. Giacomo [2007], I. Bertsek, D. Cerquera and G.J. Klein [2013], Š. Bojnec and L. Fertő [2012], F. Bollou and O. Ngwenyama [2008], A. Chatterjee [2020], S. Dewan and K.L. Kraemer [2000], H. Ishida [2015], M. Lio and M.C. Liu [2006], E.H. Nasab and M. Aghaei [2009], R.P. Pradhan, M.B. Arvin and N.R. Norman [2015], and R.P. Pradhan et al. [2018] argue that economic growth will accompany improvement in digitalization. Enhanced information and communication technologies (ICTs) will contribute to economic growth by improving productivity, reducing transaction costs, growing trade, generating innovation and development and rising employment and demand. For instance, G. Myovella, M. Karacuka and J. Haucap [2020] observe the positive contribution of digitalization on the economic growth of Organisation for Economic Co-operation and Development (OECD) countries but see a limited effect in the case of Sub-Saharan African countries. The general conclusion can be drawn from Myovella, Karacuka and Haucap [2020] that a country with limited digitalization progress may suffer deindustrialization or slow progression toward industrialization. Further, the use of technology can play a significant role in generating human and social development in terms of education, healthcare and access to modern infrastructures [Alderete, 2017; Assar, el Amrani, Watson, 2010; Gholami et al., 2010; Gudmundsdóttir, 2010; Katz et al., 2009; Koutroumpis, 2009; Spiezia, 2010]. The greater the access to technology, the greater the opportunities to gain higher learning, technical development, expertise and skills, thereby generating new jobs, increasing productivity and enhancing an equal distribution of income. Similarly, individuals without digital technology or only limited access may be left behind relative to those who are digitally knowledgeable and skilled. In fact, digitalization can be a critical factor in improving the quality of life and the future of individuals as well as poor countries.

Nevertheless, even if technology is becoming increasingly affordable and ubiquitous, it may not be helpful in creating economic opportunities for impoverished population groups.<sup>5</sup> Although the number of people living in extreme poverty has fallen, too many still struggle to meet their fundamental human needs. This may be due to the presence of the so-called digital divide, reflecting the fact that rich and educated people have better access to digital resources than poor people and seize most of the opportunities. The digital divide is, according to Wilson [2006], a state of inequality in access, distribution and use of information and communication technology among two or more populations. However, very few studies have explored the issue of the digital divide, with exception of studies such as those by B.E. Akanbi and C.O. Akanbi

<sup>4</sup> Theoretically, we also believe that income inequality will bring dissatisfaction and potentially discourage productivity among the poor as they have a tendency to be deprived of opportunities which can allow them to escape from poverty. Income inequality may also refer to inequalities such as uneven distributions of electricity, infrastructure and education.

<sup>5</sup> The poor are deprived of opportunities due to lack of income, knowledge and economic ideas. Therefore, the strategies to assist them should be comprehensive and go beyond purely monetary assistance.

[2012] and K. Venkat [2001]. Venkat [2001], looking globally, and Akanbi and Akanbi [2012], looking at Nigeria, argue that high technology is irrelevant in combating poverty. In light of the inequality in access to digital technology, the consequences are that the technological gap is widening, people are not being lifted from poverty and fewer economic opportunities are available for the poor. This raises questions about the existence of the digital divide and its impact on poverty in developing countries. This study contributes to the literature by analyzing the effect of digitalization on poverty empirically, and also by using a developing country in the sample.

## Empirical Model and Data

This study develops an empirical model that is consistent with the literature on the factors affecting poverty. It takes the following form:

$$POV = f(GDP, REM, INF, GINI), \quad (1)$$

*POV* represents poverty and is a function of four variables: income per capita (*GDPC*), remittances (*REM*), inflation (*INF*) and income inequality (*GINI*). To examine the objective of this study, we include digitalization (*DIG*) in our model. Thereby Eq. (1) can be extended as follows:

$$POV = f(GDPC, REM, INF, GINI, DIG). \quad (2)$$

The estimation model is transformed into logarithmic form and the econometric model can be expressed as follows:

$$LPOV_{it} = \alpha_0 + \alpha_1 LGDPC_{it} + \alpha_2 LREM_{it} + \alpha_3 LINF_{it} + \alpha_4 LGINI_{it} + \alpha_5 LDIG_{it} + \varepsilon_{it}. \quad (3)$$

The prefix “ln” represents the natural logarithm,  $\varepsilon_{it}$  is the error term,  $i = 1, \dots, 35$  and  $t = 2014$  and  $2016$  indicate the country and time, respectively. Accordingly,  $\alpha_1$  and  $\alpha_2$  are expected to be negative since higher economic growth and remittance flow tends to reduce the rate of poverty. The expected signs of  $\alpha_3$  and  $\alpha_4$  are positive, where an increase in inflation and inequality will result in a reduction in the standard of living and thereby increase the incidence of poverty. Finally, the sign corresponding to  $\alpha_5$  is expected to be negative if the technology gap is minimal or zero.

In this study, the two-stage least squares (2SLS) technique is used to cushion for a possible endogeneity problem. The 2SLS estimator is more precise and consistent than the ordinary least square (OLS) estimator because it is unbiased. This is because the OLS specification relies on the assumption that there is a zero correlation between  $\varepsilon$  and all of the explanatory variables. In other words, any time-invariant country-specific effect that affects poverty is not correlated with the explanatory variables. There are three conditions for the 2SLS estimator to work properly and provide results superior to the OLS. The first is that there must be at least as many instruments as potentially endogenous variables and preferably one extra. Having the same number of instruments as potentially endogenous variables is a necessary condition for model identification, but including at least one additional instrument makes it possible to perform an additional diagnostic test that is an important indicator of instrument validity. Second, the instrumental variable or variables must be strongly correlated with the potentially endogenous explanatory variable. Thereby, an F-test is performed of the null hypothesis that the coefficients on the instruments are jointly equal to zero in each of the first stage regressions. First-stage F-tests should be systematically reported whenever 2SLS is used. The last condition is that the instruments must be validly excludable from the second-stage regression, in the sense that they do not influence the dependent variable other than through the potentially endogenous variable.

## Data

Data are collected for the period 2014 and 2016. The sample countries and the study period are selected on the basis of data availability. The sample countries are divided into six groups: (1) **Sub-Saharan Africa** (Angola, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Sudan, South Africa and Tanzania); (2) **Latin America and the Caribbean** (represented by Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Uruguay); (3) **Europe and Central Asia** (represented by Belarus, Bulgaria, Kazakhstan, Romania, the Russian Federation, Serbia, Turkey and Ukraine); (4) **East Asia and Pacific** (represented by Cambodia, China, Indonesia, Philippines, Korea and Thailand); (5) **Middle East and North Africa** (represented by Egypt and Israel) and (5) **South Asia** (India and Pakistan). The present study used various data sources to obtain the datasets on dependent and independent variables to developing countries as summarized in Table 1.

Table 1. List of Variables, Descriptions and Sources

Variable	Measurement	Source
Poverty (POV)	i. Number of poor at \$1.90 a day (2011 PPP)	World Bank [n. d., b]
	ii. Number of poor at \$3.20 a day (2011 PPP)	
	iii. Number of poor at \$5.50 a day (2011 PPP)	
Income (GDPC)	GDP per capita	
Income Inequality (GINI)	Gini index	
Remittances (REM)	Personal remittances	
Digitalization (DIG)	Digital Adoption Index	
Inflation (INF)	Change in consumer price index	

## Results and Discussion

The summary of the variables employed in this study is presented in Table 2. As easily understood, the gap among the poor within \$5.50 per day is the highest, followed by \$3.30 per day and the lowest of \$1.90 per day. In other words, there is a huge disparity among the poor as well as among countries. Regarding the DIG, some countries have a high level of achievement in digital adoption given the highest score is 0.74. Nevertheless, countries are lagging far behind with a minimum score of 0.38. On average, developing countries are relatively unsuccessful in implementing digital technology as the sample average is only 0.56, just barely above the average as the perfect implementation is set to be at 1.

For the correlation analysis, there is impressive preliminary evidence of a GDPC-DIG nexus from Table 3. High correlation may be translated into high GDPC if DIG is successfully developed. Overall, there is no serious multicollinearity issue as the highest correlation coefficient is represented by GDPC-DIG.

Moving on to the regression results using 2SLS, which are shown in Table 4, all explanatory variables are statistically significant determinants of poverty, and the signs correspond to previous studies. Prior to that, the model stability tests show that the residuals are normally distributed, indicating that the model is correctly modeled and reliable. Regarding the relation-

ship between the variables, the findings indicate that economic growth has a negative and statistically significant effect on poverty. For example, the magnitude of the coefficients of 0.6226, 0.3123 and 0.4034 imply that a 1% increase in the GDPC reduces the level of poverty at \$1.90, \$3.20 and \$5.50 a day by 0.62%, 0.31% and 0.40%, respectively. Hence, economic growth is seen to be the key cause of decelerating poverty or even raising living standards for people. This finding offers a general observation that higher income alone does not offer any assistance to the poor. Inappropriate and unfavourable development strategies, while they may improve the country's income, deprive the poor of similar opportunities and enjoyment.

Table 2. Descriptive Statistics

	Mean	Std. Dev.	Min	Max
POV_1.90	2.00	1.17	0.05	10.85
POV_3.20	3.00	2.99	0.05	13.10
POV_5.50	8.28	7.57	0.10	28.80
GDPC	7.04	3.03	1.15	1.39
GINI	38.87	7.75	19.85	51.25
DIG	0.56	0.09	0.38	0.74
REM	3.59	4.59	0.08	18.65

Note: All poverty indicators are in millions, GDPC is in thousands.

Table 3. Correlation Analysis

	LPOV_1.90	LPOV_3.20	LPOV_5.50	LGDPC	LGINI	LDIG	LREM
LPOV_1.90	1.00						
LPOV_3.20	0.77	1.00					
LPOV_5.50	0.51	0.93	1.00				
LGDPC	-0.3	-0.53	-0.56	1.00			
LGINI	0.35	0.27	0.2	0.00	1.00		
LDIG	0.24	0.61	0.67	0.80	0.00	1.00	
LREM	0.46	0.48	0.43	-0.61	0.11	-0.44	1.00

Regarding remittance flows, the result implies that remittance significantly causes changes in poverty at 1 and 5%. Effectively, a 1% increase in the inflow of remittances leads to a reduction in poverty by around 0.04% to 0.16%. This finding is somewhat consistent with those of Adams and Cucuecha [2013], Adams and Page [2005], Akobeng [2016], Bang, Mitra and Wunnava [2016], Barham and Boucher [1998], Imai et al. [2014], Masron and Subramaniam [2018] and Shen, Docquier and Rapoport [2010]. This empirical evidence tends to show that remittances flows may be viewed as a way to reduce levels of poverty among poor people in developing countries because remittances earnings increase economic opportunities such as investment, spending, jobs and saving, and transform poor peoples' lives for the better.

The results for the effect of inflation on the various levels of poor, namely at \$1.90, \$3.20 and \$5.50 a day seem to be similar in terms of sign and significant level. As expected, inflation has a positive and significant impact on poverty, implying that inflation will worsen poverty of all types. Inflation will reduce the purchasing power of the limited amounts of money earned by the poor. A similar conclusion has been documented in Akobeng [2016], Chani et al. [2011],

Chaudhry and Chaudhry [2008], Fujii [2013] and Meo et al. [2018], who find that that inflation reduces people's buying power and lowers real incomes, leading to a growing number of individuals falling below the poverty line.

Table 4. Regression Analysis I – Full Sample

	<i>DV = LPOV_ \$1.90 a day</i>	<i>DV = LPOV_ \$3.20 a day</i>	<i>DV = LPOV_ \$5.50a day</i>
<i>C</i>	12.7724*** [2.58]	15.7335*** [2.60]	7.1685*** [4.26]
<i>LGDPC</i>	-0.6226* [-1.82]	-0.3123** [-2.27]	-0.4034*** [-2.39]
<i>LREM</i>	-0.1548** [-2.16]	-0.0366* [-1.94]	-0.1649** [-2.29]
<i>LINF</i>	0.1416* [1.93]	0.0335* [2.18]	0.0251** [2.20]
<i>LGINI</i>	1.4805*** [4.37]	2.5642*** [6.22]	3.0066*** [4.22]
<i>LDIG</i>	1.4656* [1.97]	-3.2663* [-1.92]	-2.3357*** [-4.48]
<b>Model Criteria</b>			
<i>Adj-R<sup>2</sup></i>	0.8157	0.7613	0.6872
<i>F-stat</i>	15.94*** (0.00)	15.31*** (0.00)	11.43 (0.00)
<i>Normality</i>	0.83 (0.56)	1.49 (0.15)	2.08 (0.60)

Note: Asterisks \*, \*\* and\*\*\* denote 10%, 5% and 1% level of significance, respectively. Figures in [ ] stand for *t-statistic* and in ( ) denote *p-value*. Normality test is based on Jarque-Bera test.

For income inequality, the results clearly show that the impact of income inequality is statistically significant for all three levels of poverty. Increasing inequality increases financial instability and reduces the likelihood that economic and social policies will foster human and economic development. This finding corroborates the results reported in recent studies by Fosu [2015], Khemili and Belloumi [2018], Leow and Tan [2019], Neaime and Gaysset [2018], Sehrawat and Giri [2018] and van Leeuwen and Földvári [2016]. This is because a more inequitable income distribution offers the poor fewer opportunities or ways of improving their living standards, highlighting the critical issue that strategies to increase incomes may only benefit the middle-class upward and not the poor. Even if the strategies effectively lower income inequality, in the absence of appropriate pro-poor strategies they may be just another development process that leaves the poor even poorer.<sup>6</sup> Therefore, an increase in poverty is usually associated with a rise in income inequality.

Considering the role of digitalization, the results for the level of poor living on \$1.90 a day are very dissimilar to those for the level of poor living \$3.20 and \$5.50 a day. Changes in digitalization have a positive and significant impact on the poverty level of \$1.90 for the poor,

<sup>6</sup> This is in one way associated with inflation. Higher income earned by the rich will allow them to demand more, pushing prices up and reducing critically the real value of money owned by the poor. Inflation will affect the rich only marginally. In the extreme case, where the middle class is also excluded from the strategies, income inequality may rise as some middle-class people may fall into poverty.

which implies that digitalization cannot lift the extremely poor from poverty. This finding is compatible with Venkat's global study [2001] and Akanbi and Akanbi's study on Nigeria [2012]. The poor who live on less than \$1.90 a day are unable to meet basic needs, job capabilities or education requirements, have limited access to economic and social infrastructure and therefore no exposure to technology and digital connectivity.<sup>7</sup> According to A. Armbrrecht [2016], more than four billion people still do not have Internet access, mostly in developing countries, which means over half of the world's people are missing out on the life-changing benefits of digitalization. Thus, digitalization does not significantly impact a country's ability to end poverty, which is becoming an increasingly important priority for developing countries. While digitalization is not a solution for people living in extreme poverty, the advantages of digitalization do benefit the poor in developing countries, especially those living on \$3.20 and \$5.50 a day. Digitalization will speed poverty reduction as new job and market opportunities grow, improve access to education and better health care and promote the widespread use of new technologies of communication and manufacturing. High Internet use, mobile applications and drones and satellites make communication and information transmission easier and improve the capacity of poor people to raise their income and participate in community development. For instance, in 2007, the Food and Agriculture Organization (FAO) launched a practice e-farming as a platform for people from around the world to exchange information, ideas and resources on the use of technology for sustainable agriculture and rural development in order to improve the livelihoods of poor individuals and communities in rural areas. Therefore, digital innovation and the use of technology create enormous opportunities and reduce the obstacles and challenges to ending poverty, especially for poor people living on \$3.20 and \$5.50 a day.

Even still, as digitalization offers ways to lift people who live on \$3.20 and \$5.50 a day out of poverty, there still exists a digital divide. Poor people with higher incomes are more likely to have better access to digital resources than poor people living in extreme poverty. Limited access to technology restricts digital skills, socio-economic development and education and thus perpetuates poverty among the extremely poor. Inadequate access to technology, according to M. Madden et al. [2012], will prevent children from gaining and strengthening the digital skills that are vital to the economy today in low-income school districts. Hence, the rapidly increasing disparities in technology use and accessibility among the poor widen not just the digital gap, but also widen the poverty and socio-economic disparities of the poor in developing countries. Digitization is a curse for poor people living on \$1.90 a day, while likely a blessing for the poor living on \$3.20 and \$5.50 a day.

Given the above discussion, this study also looks at whether the findings are sensitive to the income inequality variable. As poverty is merely the other side of the coin, a similar effect of digitalization on income inequality is expected given the neglected extremely poor in the countries. At this stage, the analysis shows that digitalization continues to deepen the digital divide and is unsuccessful in bringing poverty reductions to developing countries as shown in Table 5. Therefore, advances in digital connectivity and technology offer unparalleled opportunities and incentives to improve poor people's living conditions, affecting income inequality positively.

Additionally, a robustness check is performed by estimating the model for each period, namely 2014 and 2016 (see Table 6) as well as adding regional-dummies (see Table 7). Table 6 presents the estimation results for the individual time period. The results given in Table 6 clearly illustrate that estimates are close to those reported in Table 5. The estimated coefficient of income, remittances, income inequality and inflation are similar across panels. More specifically, the evidence from the entire panel reveals that the coefficient of digitalization in the level

<sup>7</sup> This may be worsened by the fact that most poor people live in areas where an Internet connection is either inadequate or completely absent.

of poverty at \$1.90 is positive and statistically significant. By contrast, digitalization is found to affect negatively and significantly the level of poverty at \$3.20 and \$5.50. Thus, the results show that the digital divide does exist and is worsening poverty among the extremely poor.

Table 5. Regression Analysis II – Full Sample

	<i>DV = LGINI</i>
<i>C</i>	6.7951[11.80]***
<i>LGDPC</i>	0.1810[2.18]**
<i>LGDPC</i> <sup>2</sup>	-1.0513[-2.27]***
<i>LREM</i>	-0.0344[-1.84]*
<i>LINF</i>	0.0706[-1.79]*
<i>LDIG</i>	0.0489[2.12]**
	<b>Model Criteria</b>
<i>Adj-R</i> <sup>2</sup>	0.8840
<i>F-statistic</i>	44.40(0.00)***
<i>Normality</i>	0.11(0.85)

Note: Asterisks \*, \*\* and\*\*\* denotes 10%, 5% and 1% level of significance, respectively. Figures in [ ] stand for *t*-statistic and in ( ) denote *p*-value. Normality test is based on Jarque-Bera test.

Table 6. Regression Analysis for Individual Periods

	<i>DV = LGINI</i>		<i>DV = LPOV_ \$1.90 a day</i>		<i>DV = LPOV_ \$3.20 a day</i>		<i>DV = LPOV_ \$5.50a day</i>	
	2014	2016	2014	2016	2014	2016	2014	2016
<i>C</i>	5.3072*** [7.92]	6.7560*** [3.98]	0.6616** [2.11]	4.9147*** [2.73]	6.6416*** [8.12]	13.2410*** [2.94]	4.2684*** [8.77]	7.1722*** [5.16]
<i>LGDPC</i>	0.0681** [2.10]	0.1774** [2.23]	-1.0581*** [-2.41]	-0.6382* [-1.84]	-0.5156** [-2.11]	-0.0152* [-2.03]	-0.6030** [-2.37]	-0.0895** [-2.18]
<i>LGDPC</i> <sup>2</sup>	-0.5227*** [-3.20]	-1.0768** [-2.35]	–	–	–	–	–	–
<i>LREM</i>	-0.0251* [-1.83]	-0.05368 [-1.92]	-0.2178** [-2.14]	-0.0905*** [-2.68]	-0.1239* [-1.94]	-0.1908** [-2.29]	-0.0392** [-2.22]	-0.1562** [-2.27]
<i>LINF</i>	0.0447* [1.96]	0.0124** [2.24]	0.6641** [2.10]	0.100*** [2.50]	0.0417** [2.31]	0.1901* [1.87]	0.0354*** [3.28]	0.1702* [1.87]
<i>LGINI</i>	–	–	2.6486*** [2.98]	2.5515*** [3.36]	2.8526*** [3.53]	3.0352*** [4.01]	2.8444*** [4.22]	2.0983*** [3.16]
<i>LDIG</i>	0.0779** [2.20]	0.04805** [2.11]	0.0700 [1.36]	0.8979* [1.81]	-2.3107* [1.90]	-3.4263* [-1.81]	-1.1485** [-2.18]	-2.5677*** [-2.51]
	<b>Model Criteria</b>							
<i>Adj-R</i> <sup>2</sup>	0.7980	0.9069	0.6588	0.6929	0.6886	0.6865	0.6305	0.6265
<i>F-stat</i>	24.47*** (0.00)	39.94*** (0.00)	54.06*** (0.00)	63.17*** (0.00)	72.97*** (0.00)	74.44*** (0.00)	65.21*** (0.00)	60.37*** (0.00)
<i>Normality</i>	0.26 (0.12)	0.49 (0.11)	0.25 (0.14)	0.57 (0.33)	0.27 (0.62)	0.35 (0.85)	0.27 (0.55)	0.16 (0.28)

Note: Asterisks \*, \*\* and \*\*\* denote 10%, 5% and 1% level of significance, respectively. Figures in [ ] stand for *t*-statistic and in ( ) denote *p*-value. Normality test is based on Jarque-Bera test.



Table 7. Regression Analysis for Regional Dummies

	<i>DV = LIE</i>	<i>DV = LPOV_</i> <i>\$1.90 a day</i>	<i>DV = LPOV_</i> <i>\$3.20 a day</i>	<i>DV = LPOV_</i> <i>\$5.50a day</i>
<i>C</i>	7.8629*** [4.09]	12.2853*** [2.44]	8.8489*** [3.53]	3.8001 [5.13]
<i>LGDP</i>	0.1515* [1.81]	-0.8246*** [-2.38]	-0.9374** [-2.27]	-0.9639** [-2.14]
<i>LGDP</i> <sup>2</sup>	-1.1181*** [-2.34]	—	—	—
<i>LREM</i>	-0.0702* [-1.85]	-0.1657* [-1.96]	-0.0453* [-2.05]	-0.1081* [-1.95]
<i>LINF</i>	0.1521** [2.16]	0.0420** [2.18]	0.3078** [2.34]	0.5002* [1.93]
<i>LGINI</i>	—	5.0301*** [7.14]	4.8808*** [5.00]	2.9238*** [4.05]
<i>LDE</i>	0.2088** [2.35]	0.8543* [1.92]	-1.1241*** [-3.80]	-0.5824*** [3.38]
<i>Dummy Europe and Central Asia</i>	-0.1844* [-1.95]	-0.1463** [-2.22]	-0.6363* [-1.85]	-0.9816** [-2.22]
<i>Dummy_ Latin America and the Caribbean</i>	-0.2269** [-2.36]	-0.330** [-2.30]	-1.0072*** [-2.53]	-1.2068* [-1.72]
<i>Dummy_ South Asia</i>	-0.5736*** [-3.96]	0.3668* [-1.99]	-3.6018*** [-3.10]	-2.7406** [-2.17]
<i>Dummy_ Sub-Saharan Africa</i>	-0.4677*** [-2.76]	0.2042** [2.34]	-0.7065* [-1.97]	-1.2366*** [2.61]
<i>Dummy_ East Asia and Pacific</i>	-0.0865* [-1.95]	-0.9074*** [-2.50]	-1.5877** [-2.37]	-1.6751** [-2.36]
<i>Dummy_ Middle East and North Africa</i>	-0.3899 [-2.18]	-0.0468* [2.07]	0.1363** [2.19]	-0.3939*** [-2.51]
	<b>Model Criteria</b>			
<i>Adj-R</i> <sup>2</sup>	0.4090	0.8536	0.8668	0.7606
<i>F-stat</i>	22.15*** (0.02)	139.99*** (0.00)	195.29*** (0.00)	101.66*** (0.00)
<i>Normality</i>	0.70 (0.22)	0.82 (0.32)	0.51 (0.26)	0.55 (0.39)

Note: Asterisks \*, \*\* and \*\*\* denote 10%, 5% and 1% level of significance, respectively. Figures in [ ] stand for *t-statistic* and in ( ) denote *p-value*. Normality test is based on Jarque-Bera test.

As a final robustness check, analyses were performed by incorporating regional dummies and the results are provided in Table 7. These results are quantitatively similar to those reported in Tables 5 and 6. More specifically, the coefficients associated with digitalization are statistically significant and negatively affect poverty, except for the level of poor living on \$1.90 a day. For instance, the positive coefficient shows that a 1% increase in the level of digitalization in developing countries increases poverty by 0.8543%. That is bad news because there still exist people who are living in extreme poverty around the developing countries. Although digital

use has taken place largely in developing countries, the issue of the digital divide is serious and demands immediate attention.

## Conclusion

Given the ongoing existence of poverty and income inequality in most developing countries, this study examined whether the rapid development of digitalization may have contributed to this issue. Collecting information from 37 developing countries in 2014 and 2016, this study confirms the negative hypothesis that digitalization is not really helpful to the extremely poor in these countries. As part of the possible policy implications, while promoting digitalization will certainly be good for the economic development of the countries, complementary strategies are needed to support the extremely poor to share the benefits of economic digitalization. The findings suggest that developing countries need to scale up efforts to give people the necessary technology-related knowledge, financial resources and broadband technological facilities to support, if not the current generation, the next generation of poor people. For instance, policy-makers and practitioners may enhance efforts to tackle ongoing inequalities in skills and knowledge by formulating education policies to improve the development and availability of digital learning for vulnerable groups regardless of gender, race or disability. Further, governments need to scale up policies and guidelines for digital development projects in accordance with the national developmental aims to eradicate poverty. These will help to close the digital gap and ensure the benefits of digitalization can be reaped by people who live in extreme poverty as well.

The experience of Bill Gates, founder of Microsoft, is instructive. He has contributed a great deal of his wealth back to society by establishing the Bill and Belinda Gates Foundation.<sup>8</sup> This kind of corporate social responsibility must be encouraged among technopreneurs once they have become successful in their businesses.

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<sup>8</sup> <https://www.gatesfoundation.org>.

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# Saving the SDGs? Strengthening Partnership for Achieving SDGs in the Post-Covid-19 Digital World<sup>1, 2</sup>

M. Larionova

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## Abstract

*The 2020, intended to give a good start to the Decade of Action to achieve SDGs by the target date of 2030, became a year of unprecedented health, social and economic crisis. The COVID-19 pandemic plunged the world into the worst global recession since the Great Depression, reversed progress across the full range of the SDGs jeopardizing the Agenda 2030 implementation. To build back better it is vital to assess the COVID-19 pandemic impact on economic growth and sustainable development and reflect on how to reenergize partnerships for saving the SDGs. This article aims to assess the COVID-19 pandemic impact on economic growth and sustainable development and offer recommendations on international cooperation and partnerships for saving the SDGs. It reviews estimates of the triple crisis toll on the goals implementation. It then looks at the key international institutions' initiatives to support developing countries in their response to the pandemic and associated economic shocks. The article concludes by outlining priorities for strengthening international cooperation on sustainable development which include incorporation of key components of digitalization into the SDGs as concrete targets and indicators and a comprehensive G20-led debt relief initiative providing for the released funds allocation to poverty and inequality eradication, health and education - related SDGs.*

**Key words:** sustainable development goals; COVID-19 pandemic; UN; G20; international financial institutions; debt sustainability; human development; digitalization; comprehensive debt relief initiative

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## Introduction

While 2020 was intended to launch the Decade of Action to achieve the United Nations Sustainable Development Goals (SDGs) by the target date of 2030 [UN, n.d.], the unprecedented health, social and economic crises induced by the COVID-19 pandemic plunged the world into the worst global recession since the Great Depression [IMF, 2020a] and reversed progress on

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<sup>1</sup> The editorial board received the article in October 2020.

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the SDGs [WB, 2020a], jeopardizing their implementation [UN, 2020a]. The success of the SDGs depends on two big assumptions: sustained economic growth and globalization. Both are questioned by the triple crisis. Five years after their adoption, the very foundations on which the SDGs were built have shifted [Naidoo, Fisher, 2020]. As we move toward the end of 2020, there is a need not only to assess the impact of the COVID-19 pandemic on economic growth and sustainable development, but also to reflect on how to build up cooperation and partnerships for saving the SDGs. To this end, this article reviews the COVID-19 pandemic's impact on economic growth and sustainable development and reviews estimates of the crisis' toll on the implementation of the SDGs. It then looks at the key initiatives and policy recommendations to prevent the SDGs from becoming casualties of COVID-19 and its responses [Khan, 2020]. It concludes by outlining priorities for strengthening international cooperation on sustainable development.

## A Systemic Human Development Crisis<sup>3</sup>

The pandemic affected the full spectrum of the SDGs [UN, 2020c] directly due to the health impact of the virus, through resulting crisis response and mitigation measures, and through its aggregate economic and social effects [UN, 2020d]. As the goals are tightly interlinked, the effects are interconnected, mutually reinforcing and difficult to assess. However, an assessment is vital for understanding the scale of the collapse and for planning actions for a long ascent [IMF, 2020b] to the 2030 targets.

In May 2020, the United Nations Industrial Development Organization (UNIDO) estimated that COVID-19 was driving a global poverty<sup>4</sup> rate change of 0.7% – (8.6–8.2%) – (7.8–8.1%) – pushing 49 million people into extreme poverty in 2020 [UN, 2020e, p. 60]. In October, the World Bank estimated the addition of a staggering 88–115 million people, affecting between 9.1% and 9.4% of the world's population in 2020, with the number of people newly living in extreme poverty to reach as many as 150 million by 2021 [WB, 2020a]. This assessment is a bit more optimistic than the April projection made by Andy Sumner, Chris Hoy and Eduardo Ortiz-Juarez forecasting a reversal of approximately a decade in the world's progress toward reducing poverty and an increase “in comparison to the status quo in 2018, by between 85–135 million under a 5 per cent contraction” [2020, pp. 5–6]. The impact will be long-lasting. According to Homi Kharas' calculations, by 2030 the poverty numbers will be higher than the baseline by 60 million people [2020]. Rising inequality disproportionately affects the most vulnerable.

Even before COVID-19 broke out progress toward SDG target 2.1 (ensuring access to safe, nutritious and sufficient food for all people all year round) and target 2.2 (eradicating all forms of malnutrition) was insufficient. The situation in countries struck by conflict, natural disaster and economic crises is particularly acute. The United Nations Office for the Coordination of Humanitarian Affairs Projections warned of a rise in the number of people facing acute food insecurity from the pre-COVID-19 level of 149 million to 270 million by the end of the year [UN, 2020c]. Preliminary projections suggest that the COVID-19 pandemic may add an additional 83–132 million people to the ranks of the undernourished in 2020 (based on a global economic growth drop ranging from 4.9–10%) [UN, 2020f]. Food insecurity and malnutrition have a direct bearing on the health and well-being of people and further aggravate the risks of premature mortality.

<sup>3</sup> For references see UN [2020b, p. 4].

<sup>4</sup> Defined as living on less than \$1.90 a day.



By the end of October, the COVID-19 pandemic had affected more than 44 million people and taken more than a million lives [WHO, n. d., a]. The pandemic undermined the capacity of health systems to provide essential services and medicines for all. At least two million preventable deaths could occur as a result of disrupted healthcare and resource diversion without appropriate mitigation [UN, 2020c, p. 5]. Disruption of vaccination programmes, regular check-ups and treatment of chronic diseases would “likely lead to numerous deaths, many of them avoidable. For example, in high-burden countries, it is estimated that over the coming five years deaths due to tuberculosis, HIV, and malaria will increase by 20, 10, and 36 percent, respectively” [WB, 2020b, p. 64]. The precarious state of health systems coupled with schools and university closures will result in a long-lasting human capital loss.

Learning disruptions, which have affected more than 1.5 billion students, will have long-term consequences. Erosion of skills is likely to cause a decline in income, productivity and gross domestic product (GDP). According to the Human Capital Index 2020 Update, this lost schooling may “translate to a yearly loss of over US\$872 in 2011 USD PPP, reaching a loss of US\$16,000 in lifetime earnings in present value terms assuming a 45-year work life” [WB, 2020b, p. 71]. The average GDP could be 1.5% lower on average for the remainder of the century compared to the forecast made before the pandemic [Schleicher, 2020, p. 4]. It is estimated that the COVID-19 crisis will increase the financing gap for reaching SDG 4 (quality education) in low- and lower-middle-income countries by up to one third on top of a staggering \$148 billion annual gap before the COVID-19 eruption [UN, 2020g, p. 7]. The school disruptions will exacerbate inequalities between and within countries, as the hysteresis induced by school closures may be more prevalent among students from less privileged backgrounds [OECD, 2020a]. Girls graduating from high school “are more likely to skip college during recessions because of the lower observed returns to education and because the cost of more schooling increases” [WB, 2020b, p. 94].

The pandemic is deepening pre-existing gender inequalities [UN, 2020h] as women are more likely to be informally employed or to work in industries most immediately affected by COVID-19 such as travel, tourism, retail, accommodation services, food and beverage service, and garment manufacturing [OECD, 2020b, pp. 7–8]. This translates into loss of income, inability to be self-supporting, and insecurity. Simultaneously, women are at the forefront of the battle against COVID-19 as they make up around 85% of nurses and midwives in the 104 countries for which data are available [Boniol et al., 2020]. Women carry out more care work than men, and as COVID-19 increased this workload it also amplified related problems such as access to safe drinking water, adequate sanitation and hygiene and also to affordable and reliable energy services.

A quarter of the world’s population lacks access to a reliable water supply. Unsafe hygiene practices compound COVID-19’s effects on people’s health. The pandemic heightened awareness of the extent and consequences of this access gap. And it could slow progress in meeting the water supply, sanitation and hygiene SDGs as revenue losses by local governments and water utilities affect their ability to make critical capital investments [Butler et al., 2020].

The pre-pandemic data, according to which 789 million people globally were without access to electricity and close to three billion were without access to clean cooking in 2018, indicated an urgent need to step-up efforts to reach SDG 7 [IEA et al., 2020]. Even greater efforts are required to meet the SDG 7 targets in the COVID-19 and post-COVID-19 world. Access to energy is vital to support health facilities currently lacking electricity while serving one billion people, to reduce high levels of air pollution from households without clean cooking solutions (thus facing increased risks from COVID-19 respiratory illnesses) and to support access to information through the Internet and mobile phones [UN, 2020i, p. 21]. While the investment

required for the overall financing of SDG 7 is estimated at \$1.3–1.4 trillion per year [Ibid.], the pandemic's impact on energy systems is curbing investments [Turk, Kamiya, 2020]. Moreover, this estimate does not include the enhanced electricity requirements of the cold chains needed to fight COVID-19, noting that most of the vaccine candidates will require storage in a  $-80^{\circ}\text{C}$  cold chain [Sustainable Energy for All, 2020].

The COVID-19 pandemic and the resulting containment measures triggered a sharp downturn in the first half of the year. The International Monetary Fund (IMF) projected GDP contraction of 4.4% in 2020 [IMF, 2020a], which may be only the tip of the iceberg. Significant differences in the depth of impact across regions, countries, sectors and population groups aggravate inequality. The loss of 495 million full-time equivalent jobs leads to a decline in labour incomes by 10.7% or \$3.5 trillion [ILO, 2020, p. 1]. The rise of unemployment and the collapse of tourism [UNWTO, 2020], retail and hospitality industries dealt a heavy blow to the goal of promoting sustainable and inclusive economic growth and productive employment.

Global manufacturing output growth registered a sharp decline of 6.0% in the first quarter of 2020 and a world average drop of 8.4% is forecasted by UNIDO for 2020 [UN, 2020j, p. 10]. Due to the downfall in the manufacturing sector coupled with factory shutdowns, global foreign direct investment (FDI) is expected to shrink by up to 40% in 2020 from the 2019 value of \$1.54 trillion, and by another 5–10% in 2021, with a slight recovery in 2022 and a possible rebound to the pre-pandemic level in 2022 [UN, 2020k]. The decrease will have implications for sustainable infrastructure and industrialization of developing countries. It could be partially offset by public investment in high quality digital and green infrastructure. However, domestic resource mobilization for investment into high-return infrastructure projects is constrained by the need to allocate significant funds to combat the pandemic, a decrease in fiscal revenues due to sluggish economic activity, falling tourism and commodity prices, as well as devaluation of national currencies and, accordingly, rising costs of servicing government debts, two thirds of which for low-income countries are denominated in dollars [OECD, 2020c, p. 10].

As the COVID-19 recession will result in a 6.2% decline in global per capita GDP, contractions in per capita GDP in more than 90% of economies, a higher proportion than about 85% of countries affected by the Great Depression of 1930–32 [WB, 2020c, p. 15], prospects for reducing inequality within and between countries are jeopardized. A 9.2% decline in the volume of world merchandise trade for 2020, followed by a very modest 7.2% rise in 2021 [WTO, 2020a] impairs prospects for reducing inequalities and increasing income [Cerdeiro, Komaromi, 2017]. Inequality in access to the Internet and numbers of households with computers [UN, 2020e] constrained opportunities for development and securing jobs through remote learning and employment. The COVID-19 recession impacts people's capabilities for development. The Human Development Index, adjusted for COVID-19, projects a steep decline in human development worldwide in 2020, "equivalent to erasing all the progress in human development of the past six years" [UN, 2020b, p. 6].

The pandemic affected all dimensions of city life – economic, social, cultural – further exacerbating existing inequalities, as the impact of COVID-19 is differentiated and highly correlated with poverty, household crowding, poor housing conditions and limited access to health care. Cities and areas with strong exposure to global value chains and tourism were also among the most strongly affected, with health losses amplified by revenue losses that limit the capabilities of the local budgets and authorities to provide social support for the population, deploy digital solutions and finance economic recovery measures [OECD, 2020d] as well as progress toward the targets of sustainable and resilient cities and settlements.

The impact of the pandemic on sustainable consumption and production patterns is not unequivocal. The short-term reduction in natural resources use due to reduced economic activ-

ity and consumption is coupled with pressures to loosen regulations on the circular economy and postpone the adoption of new measures so as not to impose additional burdens on businesses [Sachs et al., 2020]. Rapid digitalization of business models, production and consumption – a positive result of social isolation [Leal Filho et al., 2020] – offers an opportunity to embed climate-positive behaviour by continued teleworking and related reduction in CO<sub>2</sub> emissions [Hepburn et al., 2020, p. 15]. However, waste of medical and protective equipment is expected to rise. Around 75% of used masks<sup>5</sup> and other pandemic-related waste is expected to “end up in landfills, or floating in the seas.” Potential consequences include not only environmental damage, but also “public health risks from infected used masks and uncontrolled incineration of masks, leading to the release of toxins in the environment, and to secondary transmission of diseases to humans” [UN, 2020y].

Thus the small and short-term positive effects on environment-related SDGs (goals 6, 7, 13, 14, 15 and 17)<sup>6</sup> are offset by increased waste and reduced financial resources. Moreover, CO<sub>2</sub> emissions are expected to rebound with the economic recovery unless the rescue and recovery measures are green. So far, the assessments indicate “that 4% of policies are ‘green,’ with potential to reduce long-run GHG emissions, 4% are ‘brown’ and likely to increase net GHG emissions beyond the base case, and 92% are ‘colourless,’ meaning that they maintain the status quo” [Hepburn et al., pp. 5–6]. Relief for the oceans related to shipping, transport and tourism suspension is temporary and insufficient. Key fragility factors of marine pollution and overfishing persist [UN, 2020i]. The targets for 2020 to effectively regulate harvesting and end overfishing, conserve at least 10% of coastal and marine areas, and to prohibit fisheries subsidies which contribute to overcapacity and overfishing were not achieved.<sup>7</sup> The same is true for goal 15’s 2020 targets of ensuring the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems, sustainable management of all types of forests and prevention of the extinction of threatened species [UN, 2020m]. Implementation of the UN Strategy [UN, 2020n] for the Decade on Ecosystem Restoration 2021–30 [UN, 2020p] will require a political will, but also significant resources, which in the post-pandemic world are even scarcer than after the 2007–08 financial crisis.

The pandemic has seriously tested economies, societies and institutions: self-isolation – a test for the right of mobility; the concentration of medical resources on the fight against COVID-19 – a test for the right to other essential health services; school closures – a test for the right to education. Digital monitoring of citizens’ movements – a test to human rights. Cancellation or postponement of elections – a test for democratic rights [UN, 2020q]. These challenges, coupled with the enhanced risks of social unrest and violence, undermine the world’s ability to meet the targets of goal 16 [UN, 2020m, p. 17] on promoting peaceful and inclusive societies, access to justice for all and effective, accountable and inclusive institutions at all levels. Moreover the level of violence in countries with conflicts and humanitarian crises did not decrease [International Crisis Group, 2020] despite the UN secretary-general’s 23 March appeal for ceasefire [UN Secretary-General, 2020]. Belated adoption of the ceasefire resolution became a test for the Security Council.<sup>8</sup>

The 4.4% drop in global GDP [IMF, 2020a], the largest decline in GDP per capita in 75 years [WB, 2020c, p. 15], the 13% reduction in trade,<sup>9</sup> the disruption of global value chains and

<sup>5</sup> UNCTAD estimates that global sales of masks will total some \$166 billion this year, up from around \$800 million in 2019.

<sup>6</sup> Globally, GHG emissions might fall by 4–7% in 2020 [UN DESA, 2020].

<sup>7</sup> The declaration’s text has not been finalized. For the available version with tracked proposed changes, see UN [2020z].

<sup>8</sup> The UN Security Council adopted the resolution on 1 June 2020 [UN, 2020r].

<sup>9</sup> In an optimistic scenario (in a pessimistic scenario – 32%) [WTO, 2020b].

the 40% decline in foreign direct investment flows<sup>10</sup> challenge the goal of strengthening global partnership for sustainable development at a time when it is more important than ever. Indeed, all domestic resources are now mobilized for the urgent needs of fighting COVID-19 and its consequences, stabilization of revenue from tax of economic activities cannot be expected sooner than 2022,<sup>11</sup> remittance flows to low- and middle-income countries are expected to decline by 7.2% to \$508 billion in 2020 with a further decline of 7.5% to \$470 billion in 2021 [WB, 2020d, p. 6], and inflows of external private finance to official development assistance (ODA)-eligible countries in 2020 are expected to plunge by \$700 billion compared to 2019 levels. Despite the intent of the members of the Development Assistance Committee (DAC) to protect ODA levels [OECD, 2020e] the Organisation for Economic Co-operation and Development (OECD) calculates that if DAC members keep the same ODA to gross national income (GNI) ratios as in 2019, total ODA could decline by \$11 billion to \$14 billion, depending on a single- or double-hit recession scenario on member countries' GDP [Ahmad et al., 2020]. Increases in debt servicing costs reduce the available fiscal space. The G20 Debt Service Suspension Initiative covers only 73 of the world's poorest countries [WB, 2020g], does not include debt to private creditors, and so far only affects 3.65% of the total debt service cost of developing countries in 2020 [Fresnillo, 2020]. "With all sources of external private finance falling immediately, this presents an unprecedented pressure for developing economies, exceeding the post-2008 Global Financial Crisis experience by 60%" [OECD, 2020c, p. 8].

Digital technologies could not be effectively deployed to counter the impact of COVID-19 on education, health and employment as the digital divide is still huge with only 19% of citizens in the least developed countries (LDCs) online in 2019 and 47% in developing countries [ITU, 2019]. A decline in exports is expected to deteriorate the situation, especially for the LDCs. Emerging markets' financial needs are also enormous. Estimated at \$2.5 trillion, they significantly exceed these countries' own reserves and domestic resources [IMF, 2020c]. As a result, developing countries and emerging market economies are unable to implement support measures needed to overcome the crisis and return to the growth trajectory on the same scale as developed countries. The scale of assistance received from multilateral institutions is incomparable with the \$8 trillion mobilized to overcome the crisis by the world's leading economies [Battersby et al., 2020]. Thus, the risks of deepening economic and social inequality not only within countries, but also between countries, significantly increase.

The recovery of progress on the SDGs will be a much longer and harder ascent than the road to economic recovery. Many initiatives are already being undertaken, mostly focusing on support to developing countries in their response to the pandemic and associated economic shocks. The UN system coordinates the work under the Strategic Preparedness and Response Plan, the Global Humanitarian Response Plan and the UN COVID-19 Response and Recovery Fund. Local assistance to countries and communities was deployed already in spring 2020. By October 2020, about \$2.5 of the \$10 billion needed was mobilized [UN, 2020s, pp. 9–10]. The G20 adopted the Action Plan on Supporting the Global Economy Through the COVID-19 Pandemic [G20, 2020a], pledged to provide financial support to the World Health Organization (WHO) Strategic Preparedness and Response Plan and immediate resources to the New Solidarity Fund to help fight the COVID-19 pandemic. The WHO's COVID-19 response strat-

<sup>10</sup> FDI is expected to continue declining by 5–10% in 2021 and begin to recover only in 2022 [UN, 2020k].

<sup>11</sup> And even after return to the current level, revenues will not be sufficient, as out of 124 countries eligible for official development assistance with published data on tax revenue in 2017, more than one third (46) have had tax-to-GDP ratios below 15%, which is a widely considered benchmark for effective state functioning and promotion of economic development. Almost two thirds of countries in this sample (79) had collected tax revenue below 20% of GDP [OECD, 2020c].

egy [WHO, 2020] serves as the basis for developing national response plans. But the WHO is fulfilling its role as a coordinator of the international community's efforts with a very tight budget, and by autumn its COVID-19 programme was only 80% resourced [WHO, n. d., b].

The IMF generated credit resources of \$1 trillion and by mid-October provided assistance worth of special drawing rights (SDR) 64 billion to 80 countries, mainly using emergency and precautionary lending tools [Gregory, Lin, Mühleisen, 2020]. The Fund could do more if it received approval for an additional SDR emission and allocation for alleviating the problems of developing countries experiencing foreign exchange reserves difficulties [Plant, 2020]. In the same period the World Bank Group provided finance for health systems support projects in 111 countries [Malpass, 2020] and pledged to make available \$160 billion over a 15-month period [WB, 2020h], though a shortage of financial resources expected in 2021 may constrain its future activities [WB, 2020e, p. ix]. The multilateral development banks (MDBs) made a \$230 billion commitment to emerging and low-income countries as a response to the pandemic [G20, 2020b]. However, this is still only a fraction of what is needed [Kharas, Dooley, 2020]. Moreover, though new lending provides funds for temporary support, it is scaling up debt, further exacerbating the fundamental problem of debt sustainability. Rescue of the SDGs requires a coordinated and comprehensive approach.

## Priorities for Strengthening the Means of Implementation and Revitalizing Global Partnership for Sustainable Development

Two priorities stand out: harnessing the benefits of digitalization for sustainable development and putting forward a new comprehensive debt relief initiative for SDGs which would provide for reallocation of released funds to SDGs related to poverty and inequality eradication, and health and education.

### ***Operationalizing Digitalization Components in the SDG Targets and Indicators***

In the five years since the SDGs were introduced, the world has leapfrogged in terms of digital transformation. Digital technologies and solutions, which have become a critical resource in the fight against COVID-19 and a factor of sustained economic activity during the pandemic, can be a vital resource for achieving SDGs. The UN Secretary-General's Road Map for digital cooperation put forward a set of actions to accelerate global digital cooperation to facilitate progress toward achieving the goals by 2030 [UN, 2020t]. Indeed, for digitalization to become a driver of inclusive growth and sustainable development, many obstacles need to be addressed, including the digital divide in Internet access,<sup>12</sup> lack of digital public goods,<sup>13</sup> data protection and privacy concerns,<sup>14</sup> gaps in international coordination, cooperation and governance of artificial intelligence,<sup>15</sup> cybersecurity and critical infrastructure protection challenges,

<sup>12</sup> Only 53.6% of the world's population currently uses the Internet, which means that the number of people without Internet access is about 3.6 billion. Least developed countries have the lowest access rate – only 19% of the population [ITU, 2019].

<sup>13</sup> Such goods can be defined as open source software, open data, artificial intelligence models, standards and content that comply with privacy regulations and other applicable international and national laws, standards and best practices, and that do not cause harm.

<sup>14</sup> The potential cost of data privacy violations worldwide is estimated to exceed \$5 trillion by 2024 [Security Magazine, 2019].

<sup>15</sup> There are currently more than 160 sets of ethical principles and principles of management in the field of artificial intelligence around the world, adopted by specific organizations and countries or agreed at the international level. However, there is no common platform for bringing these separate initiatives together.

and the diffuse and exclusive nature of digital cooperation architecture [UN, 2020v, p. 21]. This is an enormous agenda, which can be disaggregated into concrete targets and indicators to supplement the existing SDGs' list of targets.

The proposed additions to the targets do not constitute either an exhaustive list or an ultimate truth (Table 1). They are intended as a start for a possible discussion on how digitalization can be operationalized and integrated into the SDGs.

Table 1. Proposed Additions to SDG Targets and Indicators

Goals and Targets	Indicators
Goal 1. End poverty in all its forms everywhere	
Target 1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	Indicator 1.4.1 Proportion of population living in households with access to basic services  To be supplemented by <i>1.4.3 Proportion of population living in households with access to internet and digital devices (computers)</i>
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	
Target 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	Indicator 2.4.1 Proportion of agricultural area under productive and sustainable agriculture  To be supplemented by <i>2.4.2 Proportion of agricultural area under productive and sustainable agriculture empowered and monitored by digital technologies</i>
Goal 3. Ensure healthy lives and promote well-being for all at all ages	
Target 3.c Substantially increase health financing, <i>development of telemedicine</i> and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States  to be supplemented with <i>development of telemedicine</i>	Indicator 3.c.1 Health worker density and distribution  To be supplemented by <i>3.c.2 Development and access to telemedicine</i>
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	
Target 4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all  to be supplemented by <i>4.d Significantly increase the number of households with access to (a) the Internet for learning purposes; (b) computers for learning purposes</i>	<i>Indicator 4.d.1 Proportion of households with access to (a) the Internet for learning purposes; (b) computers for learning purposes</i>
Target 4.c By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States  To be supplemented by <i>4.e By 2030, substantially increase the supply of qualified teachers with remote teaching skills</i>	Indicator 4.c.1 Proportion of teachers in: (a) pre-primary; (b) primary; (c) lower secondary; and (d) upper secondary education who have received at least the minimum organized teacher training (e.g. pedagogical training) pre-service or in-service required for teaching at the relevant level in a given country  To be supplemented by <i>4.e.1 Proportion of teachers with remote teaching skills</i>

Goals and Targets	Indicators
Goal 5. Achieve gender equality and empower all women and girls	
Target 5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women	Indicator 5.b.1 Proportion of individuals who own a mobile telephone, by sex  to be supplemented by <i>5.b.2 Proportion of individuals who own a computer and have access to Internet, by sex</i>
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
Add target <i>8.11 By 2030, devise and implement policies to promote remote work and strengthen the capacity of employers and employees to expand remote work models</i>	Add indicator <i>8.11 Proportion of remote jobs in employment</i>
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
Target 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	Indicator 9.4.1 CO2 emission per unit of value added  To be supplemented by <i>9.4.2 FDI into green infrastructure and high-quality digital infrastructure</i>
Goal 10. Reduce inequality within and among countries	
Target 10.6 Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions  To be supplemented by <i>10.8 Build inclusive digital governance architecture</i>	
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	
Target 17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress	Indicator 17.4.1 Debt service as a proportion of exports of goods and services  To be supplemented by <i>17.4.2 Debt relief as a proportion of total debt (as of the end of 2020)</i> <i>17.4.3 Debt relief amounts allocated to poverty and inequality eradication, health and education related SDGs</i>

Source: [UN, 2017].

### **A New G20-Led Comprehensive Debt Relief Initiative for SDGs**

The costs of anti-pandemic measures, the drop in revenues, currencies devaluations and increased indebtedness came on top of debt levels that were already historically high [Georgieva, Pazarbasioglu, Weeks-Brown, 2020], creating immediate risks to liquidity and solvency and long-term risks to sustainable development. The G20 Debt Service Suspension Initiative (DSSI) does not reduce debt, simply deferring it. The DSSI, which was estimated to amount to approximately \$477 billion in 2018 debt stock [Bolton et al, 2020], is projected to allow 46 participant countries to suspend payments for a total of USD 11.7 billion even after a 6-month extension [Munevar, 2020]. The G20 finance ministers and central bank governors acknowl-

edged the problems with the private creditors' participation in the DSSI and recognized that the scale of the crisis may require debt treatments beyond the DSSI on a case-by-case basis [G20, 2020b]. However, this promise, as well as the G20 and Paris Club decision on a "Common Framework for Debt Treatments Beyond the DSSI" [Paris Club, 2020], published in November on the eve of the G20 summit [G20, 2020c], is limited in scope, conservative in approach and does not address debt sustainability and equitability.

The Framework will be implemented on the Paris Club's terms, including the establishment and successful completion of an IMF programme and a successful track record of compliance with the Club [Munevar, 2020]. The initiative does not include the multilateral financial institutions. The IMF and the WB defend their non-participation in suspension of debt service payments on the grounds that there is potential for a negative impact on their financial sustainability [WB, 2020f] as they need resources to support countries' responses to the pandemic [IMF, 2020d]. Neither the Joint IMF-WBG Staff Note: Implementation and Extension of the Debt Service Suspension Initiative [IMF, WBG, 2020] nor the IMF proposal on The International Architecture for Resolving Sovereign Debt Involving Private-Sector Creditors – Recent Developments, Challenges, and Reform Options [IMF, 2020e] even consider the option of suspending debt payments to the Bretton Woods institutions. European Network on Debt and Development calculations show that "in 2018, the World Bank alone held \$103.73 billion in debt owed by DSSI eligible countries. From May to December 2020 – the period in which, for now, the DSSI is applicable for bilateral creditors – the cancellation of payments to the World Bank would free up \$2.46 billion. This could grow to more than USD 4 billion of additional resources if the cancellation was extended for a full year into 2021" [Fresnillo, 2020, p. 11].

Private creditors, represented by the Institute of International Finance (IIF), stated their support of the DSSI and developed instruments to facilitate the process. However, the IIF Update of Progress shows that by mid-July no waiver [IIF, n.d.] had been granted [IIF, 2020a]. The debtor countries are reluctant to approach due to the risk of ratings downgrades and associated restriction of their ability to access finance in global capital markets. Again, even in case of suspension the payments will be deferred, added to the original amount and accrue interest [IIF, 2020b]. Thus the pressure would be delayed rather than resolved. All in all, in its current mode the DSSI is unlikely to succeed [Munevar, 2020]. Moreover, there are 68 countries not eligible to participate in the G20 DSSI, with estimated external public debt service amounts projected to reach \$273.43 billion in 2020. They have very few options for addressing debt burdens except case-by-case, complex and lengthy negotiations with a myriad of external private creditors [Fresnillo, 2020, p. 18].

The UN secretary-general called for an across-the-board debt standstill for all developing countries that have no access to financial markets and cannot service their debt and for the amendment of structural deficiencies in the international debt architecture to prevent defaults leading to prolonged financial and economic crises [IMF, 2020g]. Indeed, a comprehensive debt relief initiative is needed. It should include at least three initial steps.

First, an agreement of the G20, Paris Club members and international financial institutions should be negotiated to suspend, at least for five years and possibly write off, the accumulated debt services amounts, with allocation of the released funds to poverty and inequality eradication.<sup>16</sup> Arguments of international law that can be invoked to justify debt cancellations include: force majeure, state of necessity and fundamental change in circumstances [CADTM, 2020]. The relief target of half of \$2.5 trillion needed according to United Nations Conference on Trade and Development (UNCTAD) estimates [2020] would be justified by the precedent [UN, 2020w, p. 14]. Economically, with G20 fiscal and monetary actions amounting to

<sup>16</sup> In line with the request of the African Union [AU, 2020].



about \$10 trillion to support their economies, “writing off the USD 3 trillion debt of the 135 countries of the South, or 83% of the world’s population, does not seem to be an insurmountable obstacle” [Rivié, 2020]. Participation of private creditors should be ensured, otherwise “resources freed up via the efforts of other creditors and new emergency financing provided to fight the impacts of COVID-19, will effectively be diverted to pay non-participating creditors” [Fresnillo, 2020, p. 30].

Second, to support borrower countries that decide to suspend payments to private creditors and reallocate saved funds to increase health spending in response to COVID-19, the G20 and IFIs should agree on a debt standstill mechanism for private sector creditors. Some proposals have already been put forward. Daniel Munevar and Grygoriy Pustovit argue that the IMF has a mechanism in place to impose debt standstills. Article VIII, Section 2 (b) of the IMF articles of agreement allows the IMF to render exchange contracts unenforceable in domestic courts of IMF member countries following specific criteria. An agreement on a broad and authoritative interpretation of the exchange contracts’ terms to cover debt contracts by the IMF executive board is required for its application. This interpretation would allow the sovereign borrower to request invocation of defence based on Article VIII, Section 2 (b) if the creditor decides to initiate litigation to enforce their claims in a foreign court, including the U.S. and the UK. Apart from the possibility of using existing provisions without amending the articles of agreement, the mechanism’s advantages include “uniformity and comparability of treatment of the private creditors on a global level and incentives and time for creditors and debtors to negotiate and find a solution representing the best collective interest” [Munevar, Pustovit, 2020]. However, the history of the issue’s discussion in the IMF suggests that the negotiation may be difficult and may meet opposition from the U.S. and the UK.

Another option put forward by the Centre for Economic Policy Research envisages “that multilateral institutions such as the World Bank or other multilateral development banks create a central credit facility allowing countries requesting temporary relief to deposit their stayed interest payments to official and private creditors for use for emergency funding to fight the pandemic. Principal amortisations occurring during that period would also be deferred, so that all debt servicing would be postponed” [Bolton et al., 2020]. This proposal has the advantages of equal treatment of the borrower’s individual creditors, verification of how saved funds are actually spent, possibility of deferring the principal payments, relative flexibility and expediency. At the same time there may be little appetite for setting up a web of central credit facilities with potential expansion of the IFIs’ bureaucracy. Whichever mechanism is adopted it will need the strong and cohesive support of the G20.

Third, the G20, the UN and financial institutions should explore the establishment of a mechanism under UN auspices which would support sovereign debt cancellation and restructuring, taking into consideration both the immediate threats and the requirements of implementing the sustainable development goals. Proposals to set up an autonomous international organization [UN, 2020w] may be viewed as unrealistic and idealistic. But cautious diplomatic formulas calling for comprehensive actions on debt will not resolve the problem. Fora, analysis and reports should be followed up by a high-level substantive and dedicated process. The UN Economic and Social Council (ECOSOC) Forum on Financing for Development follow-up (FfD Forum) track does not have either the capacity or political leadership<sup>17</sup> to launch the process. However, the UN Secretary-general could put forward the initiative to G20 leaders. The G20 leaders’ support and a mandate to the G20 Development Working Group to engage

<sup>17</sup> The complacency and lack of ambition of the summary by the president of the Economic and Social Council of the forum on financing for development follow-up (New York, 23 April 2019 and 2 June 2020) are striking [UN, 2020x].

with the UN and other international institutions on the elaboration of a concrete proposal for a debt relief and sustainability mechanism might become an important step toward debt sustainability. It would confirm the G20 commitment “to contribute to global efforts to implement the 2030 Agenda, including the Sustainable Development Goals (SDGs) and the Addis Ababa Action Agenda on Financing for Development (AAAA)” as stated in the G20 Action Plan on the 2030 Agenda for Sustainable Development adopted in Hangzhou [G20, 2016] and reiterated in Hamburg. Most importantly, it would provide a chance to develop a pragmatic and innovative solution to the systemic risk of unsustainable debt accumulation, preventing potential future crises.

## Conclusion

The confluence of crises caused by the COVID-19 pandemic set back progress on sustainable development goals and jeopardized implementation of the 2030 Agenda. The triple shock became a major test to the Global Partnership for Sustainable Development. Human losses are exacerbated by a significant reduction of people’s capabilities for development, resulting in a decline in human development worldwide equivalent to erasing six years of progress. Contraction of GDP, trade, employment and investment undermine foundations for growth and development.

International institutions have undertaken initiatives to support developing countries in their response to the pandemic and associated economic shocks. Understandably, these actions mostly focus on immediate risks rather than their long-term impacts, recovery and “building back better” to deliver the SDGs by 2030. Moreover, the IFIs’ lending is scaling up an already unsustainable debt burden. The G20 Debt Service Suspension Initiative defers payments but does not reduce debt. Importantly, it does not include payments to multilateral and private creditors and leaves the 68 countries not eligible for participation without support. Put together, the costs of anti-pandemic measures, the drop in revenues and growing debt on top of historically high pre-crisis debt levels create immediate solvency risks and long-term threats to sustainable development.

Rescue of the SDGs is not feasible without innovative and comprehensive solutions. At least two priorities should be considered. To harness the benefits of digitalization for sustainable development, key components of digitalization should be incorporated into the SDGs as concrete targets and indicators. The list proposed in this article is intended as a start for a possible discussion. To address the systemic risk of unsustainable debt accumulation and prevent potential future crises, a comprehensive debt relief initiative is needed. The G20-led process would include as a first step negotiating an agreement of the G20, Paris Club members and international financial institutions to suspend, at least for five years with a possible write off, the accumulated debt services amounts, an agreement with the IFIs on a debt standstill mechanism for private sector creditors and consultations on the establishment of a mechanism under UN auspices which would support sovereign debt cancellation and restructuring. To re-energize the human development process, the initiative should provide for the condition that the released funds will be allocated to SDGs on poverty and inequality eradication, and health and education.

The G20 Comprehensive Debt Sustainability Initiative for SDGs will help strengthen means of the SDGs’ implementation and revitalize the Global Partnership for Sustainable Development. It will demonstrate that the G20 remains both a crisis manager and a premier forum of economic cooperation committed to the goal of strong, sustainable, balanced and inclusive growth.

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