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Addressing Global Issues With Collective and Concerted Actions:

Indonesian Scholar Perspectives for the G20 Forum

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ADDRESSING GLOBAL ISSUES WITH COLLECTIVE AND CONCERTED ACTIONS: Indonesian Scholar Perspectives for the G20 Forum

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FOREWORD
RECTOR OF UNIVERSITAS GADJAH MADA

May peace, mercy, and blessings of Allah be with you

As the Rector of Universitas Gadjah Mada, I appreciate the Board of Professors for the initiative to publish a book entitled *Addressing Global Issues with Collective and Concerted Actions.* As an academic work and policy dialogue, this book is timely and of high importance as a significant contribution to the 2022 G20 Presidency of Indonesia. It is in line with the main theme of the presidency, "*Recover Together, Recover Stronger"* covering three key issues: Global Health Architecture, Digital Transformation, and Sustainable Energy Transition.

The Global Health Architecture is a relevant topic that gather countries in the world to work collectively towards equality of global health standards. This also encourages the global community to strive for resilience in anticipating any possible pandemic in the future. It is important to strengthen global health system to become more equitable, inclusive, and responsive to crisis. Learning from our experience in the past pandemic, we should prevent diseases and promote health, not only for human but also for general ecosystem of the planet. We have come to realize that curative treatments are too expensive and too late. So, prevention is a better approach. In doing so, it is important to promote education of public health and campaign for preventive health using digital technology and other new and alternative multimedia.

The implementation of digital transformation will inevitably stimulate rapid changes of the global economic landscape. Cooperation and collaboration will be stronger and more efficient with the advancement of digital technology. Digital transformation also ensures openness and inclusiveness to parties involved in global collaboration. Acceleration of small-scale economy to become a global-scale economy with the

involvement of digital ecosystem brings more opportunities to women, youths, and other marginalized parties to have significant role in the future.

With regards to Sustainable Energy Transition, we need paradigm shift in our development, especially since Indonesia is an archipelagic state with thousands of islands which are threaten by climate change. Huge efforts and great investment should be put in research and development in clean and renewable energy to fight the effect of global warming. Global commitment and collaboration of actions on sustainable energy transition will eventually improve life and sustain the future.

Universitas Gadjah Mada has many professors and young researchers with great interest in health and general issues of our planet in general. Their ideas, innovations, and implementations presented in this book need further scale up for more collective, concerted, and collaborative actions with global partners.

I understand that this book contains knowledge and competence from experiences written by the members of the Board of Professors in collaboration with lecturers and researchers in their respective fields. This book is published with hopes to contribute to the forum of the *Sherpa Meetings of Indonesia G20 Presidency.* We are hopeful that this will open more doors of opportunities for further cooperation and collaboration in education, research, and community services, in accordance with the expertise of professors and researchers at Universitas Gadjah Mada.

We are keen to see that the invaluable contributions in this book will eventually accelerate further research and add color and flavor to concrete cooperation in the development towards a better life. With its role through G20 Presidency, may Indonesia contribute significantly to inclusivity and justice for all actors and sectors of development towards sustainability. I am optimistic that this contribution of thoughts and ideas from Universitas Gadjah Mada will find their way to benefit readers so they can be part of changes for the better.

Yogyakarta, Indonesia, September 2022
Ova Emilia

FOREWORD
CHAIRPERSON BOARD OF PROFESSORS UNIVERSITAS GADJAH MADA

Assalamualaikum wr.wb.
(*May the peace, mercy, and blessings of Allah be with you*)

Board of Professors of Universitas Gadjah Mada supports Indonesia in the G20 Presidency with the main theme of "*Recover Together, Recover Stronger"*. Indonesia invites all the citizens of the world to help each other and work together in overcoming the pandemic and crisis towards resilience dan sustainably grow stronger.

That is the reason for Board of Professors of Universitas Gadjah Mada is to publish the book with the title of *Addressing Global Issues with Collective and Concerted Actions*. The topics of the book has been made into a seminar in June 2022 for a series of commemorations for the 50 years of the Stockholm Declaration, an accord to look after the environment for mankind. The book gives a global outlook and Indonesia's experience regarding three key issues which are *Policy Notes for Indonesia G20 Presidency on Global Health Architecture, Digital Transformation, and Sustainable Energy Transition.*

This book contains knowledge and competence from experiences written by the members of the Board of Professors with lecturers and researchers in their respective fields. This book is expected to be able to give a contribution in the forum *Sherpa meetings Indonesia Presidency G20* and the opportunity of cooperation and collaboration in education, research and community service, in accordance with the expertise of the professors and researchers of Universitas Gadjah Mada.

The authors formulated a topic of discussion and contribution of ideas that involved a team of experts according to their fields. In this first part of this book is about *Global Health Architecture* (*GHA*) which is the authors' creation that includes being active in education and research as well as

community service and health policies formulation and its relationship with mankind's wellness and planet earth. The second part is explaining *Digital Transformation* (*DT*) which consist of authors from researcher and lecturer who have many experiences in digital public policy and practices in government, business sector, and education. The third parts explain *Sustainable Energy Transformation* (*SET*) which transform economy and social development toward sustainable way.

This book is expected to accelerate further research, and also to add color to concrete cooperation in the development of a better life on earth. Through this cooperation, G20 gives contribution to inclusivity, collaboration and justice for all actors and sectors of development towards sustainability.

Hopefully this contribution of thinking from Universitas Gadjah Mada can be beneficial for the readers to make changes for the better.

Waalaikumsalam wr.wb.
(*And peace be upon you and God's blessing*)

Yogyakarta, Indonesia, July 2022
Mochammad Maksum Machfoed

PREFACE
THE INDONESIAN PERSPECTIVE ON THE ROLE OF G20 COUNTRIES

Wahyudi Kumorotomo and Muhammad Baiquni

This book comes under the auspices of Dewan Guru Besar (Board of Professors) of Universitas Gadjah Mada, which conducted scholarly discussions on the role of G20 countries for addressing global pressing issues. All the chapters are written by professors and researchers from various faculties at Universitas Gadjah Mada who wish to contribute on perspectives and actionable agendas for the G20 forum. We expect that the multi-disciplinary approach among the university scholars would provide a comprehensive understanding on what to be considered by the G20 country leaders. G20 was initiated by seven developed countries in response to the financial crisis in late 1997. Since then, G20 has been expanding in terms of its membership and agenda. The recurring financial crisis in 2008 has influenced the expansion of membership from mostly developed countries to the emerging economies such as Brazil, China, Indonesia, India, and South Africa based on an argument that global economic issues need to be addressed by involving countries both from the North and the South hemisphere. At the same time, G20 agenda has been expanding beyond financial and core economic issues to incorporate other pressing issues such as climate change, digitalization, sustainable development, and women's empowerment. Therefore, this book is expected to enrich discussions under the sherpa track, the non-financial track of the G20 that recently has been involving various elements such as academia, community activists, private companies and non-governmental organizations.

There are two lines of argument to be presented in this volume. First, we would argue the importance of equality, inclusiveness and concerted

actions for any global issues. There are many global issues that can only be addressed with collective and concerted actions among global stake-holders, communities and citizens. Lesson learnt from the global Covid-19 pandemic and the current G20 theme of "Recover Together, Recover Stronger" emphasized the inter-dependency among countries and that all delegates in the G20 should bring up the spirit of respect and togetherness in finding long-term solutions. Second, in line with the three focal points that have been set up for the G20 agenda, we would like to present the Indonesian scholar perspective. The Indonesian Government has accentuated that G20 forum should not only resulted in formal agreements and communiques, but it should also drive pragmatic and real actions. Therefore, we divide this book according to the three focal points for the G20 forum in Indonesia, i.e. global health architecture, digital transformation, and sustainable energy transition. It is expected that the analysis and arguments in this book would help to understand the issue, to map out the inter-connectivity among issues, and to provide alternative solutions. Most of the analysis in chapters are based on the Indonesian experience and probably represent typical developing economies, but the idea of inclusiveness would add the strength of the arguments.

In 2022, with Indonesia being entrusted to assume G20 presidency under the post-pandemic outlook and many geo-political shifts, there have been a bunch of both hopes and challenges. Unlike formal international organizations such as UN, IMF, and World Bank, G20 does not have a permanent secretary. Meetings and agendas are determined by the so-called triumvirate system, a form of leadership or congregation held by three countries with the same role. This year, it includes Indonesia as the current president, Italy that previously has served as the president, and India that will become the president next year. The triumvirate system of leadership has its advantages and disadvantages. The circular leadership system would definitely assure equality and inclusiveness among the G20 members both from industrial and emerging economies. The spirit of deliberation in the global governance and the continuity of issues being discussed are also supported by the circular leaderships. However, as G20 is a kind of "loose club of countries" (Luckhurst, 2016: 3) that is based on consensus and involving various non-government elements, its accountability and compliance are frequently questioned. The involvement of "engagement

groups" including the youth organizations in Y20, businesses in B20, think-tanks in T20, civil society communities in C20, urban planners in U20, labour organizations in L20, scientists in S20, members of parliaments in P20, and women in W20 are added complexity in terms of focus and prioritized actions.

Some experts are sceptical about the effectiveness of G20 in implementing its formal agreements. However, as a group of countries that represents around 75 percent of global trade and 80 percent of world GDP, any kinds of agreements within the G20 would have an impact to the respective countries. While Indonesia might not be considered as powerful enough in convincing leaders of developed countries, as the third biggest democracy after the USA and India and the fourth rank of world population with an emerging economy, Indonesian presidency in G20 remains a good opportunity to tackle current global issues. Indonesian Government has a privilege to set the agenda for the meetings and determine which countries that will be invited for the leaders' summit in mid November 2022. As such, Indonesia can take up the role of balancing the frequently conflicting interests between developed and developing countries.

The Indonesian Government has stated that the theme for G20 in 2022 is "Recover Together, Recover Stronger" and it is apparent that many decision makers and community members in the country are enthusiastic to work with delegates and representatives who will come to Bali. Unfortunately, the diplomatic task for urging all the G20 country members to work together is facing an uphill battle when the world is shocked by the war between Russia and Ukraine, which resulted in deepening rift among the countries and a dire consequence on food security and energy supply for Europe and other parts of the world. Mister Joko Widodo, the Indonesian President, has stated that initial communication with leaders in developed countries had to be followed by a delicate diplomatic communication with the president Vladimir Putin of Russia and President Volodymyr Zelensky of Ukraine to consider ending the war and to ensure that G20 summit would be held as planned and attended by all the G20 head of states (Secretary of State Ministry, 29 April 2022). This book will not discuss how such international political changes would have a consequence to the G20 forum, but it would argue that the agenda for economic recovery and the global challenges are still there.

THE CHALLENGE OF FUTURE WORLD: TOWARDS EQUAL AND INCLUSIVE GLOBAL GOVERNANCE

The Covid-19 pandemic has heavily influenced the global agenda in the last three years, including that of the G20 summit in 2021 when Italy was the president. The four strategic priorities for creating transformative resilience against global pandemic were formulated as: (1) healthy and sustainable recovery, (2) building one health resilience, (3) coordinated and collaborative response, and (4) accessible vaccines, therapeutics and diagnostics (Anonymous, 2021). It is obvious that health issues with a global magnitude like Covid-19 had significantly changed the global leaders' perception on global governance. At the very least, the importance of collaborative response and accessibility of vaccines for all citizens in all countries have been admitted by most leaders although their actual responses to the issues of global health might not follow suit. For the 2022 presidency, the Indonesian Government has expected the so-called "lighthouse deliverables" in which health issues and the need for collaborative efforts remain a concern. The three lighthouse deliverables are formulated as: (1) development of global health resilience systems, (2) harmonization of global health protocol standards, and (3) expansion of global research and manufacture hubs for preventive and mitigation responses (Anonymous, 2021). Again, all these formulae for handling global health issues have called for coordinated policies and collaborative measures beyond the borders of countries.

The general agreements among leaders in the G20 may not imply immediate benefits for the containment of the pandemic. All the aforementioned declarations and communiques would not have a significant impact until they are followed with more technical measures. The G20 initiatives would have a real impact when it was agreed in Riyadh, for example, the deferral of foreign debt repayments among low-income countries, a USD 5 trillion injection of funds for Covid-19 containment efforts, the reduction or removal of import duties and taxes on vaccines, hand sanitizers, and medical equipment. Therefore, it is important to ensure that, as a loose club of countries, the G20 forum would not end up only with agreements, communiques, declarations, and other formalized results. Skeptical analyst would say that, as G20 does not rest on a constitutional treaty and its procedures are not written, its governance often reproduces oligarchic tendencies and is heavily dependent on evolutionary practices

rather than collective enterprise (Cooper and Pouliot, 2015) and, for that reason, it would not imply substantial changes.

Given the fact that G20 was initiated in after the global financial crisis in late 1990s, in which developed countries realized that exclusive G7 was no longer capable of managing a global crisis, many would argue that G20 is also structurally biased in favor of Western powers. The contention is that even a more inclusive G20 would only start paying close attention to developing world problems when the issues begin to have an impact on the interests of the rich and powerful countries. However, such contention might by too simplistic if one considers the process within the G20 meetings. The G20 gatherings do not only involve head of states, cabinet ministers, and government staffs, but also representatives of non-state actors such as business, labor, think-tanks, youths, and other civil society grouping of the 19 states and the EU. The Indonesian secretariat for G20 forum stated that there are 437 events to be held, comprising 184 meetings and 253 side events, before the Bali summit on November (Susiwijono, 2022). While experts are frequently questioning the effective participation of the "engagement groups", it is worth noting that G20 is one of the most inclusive fora in the world.

Certainly, it would be an over-statement that the inclusive nature of G20 would also result in effective global decision-making process. In the aftermath of global financial crisis in 2008, there was a strong statement of the national leaders that G20 was the "premier forum for international economic cooperation" (www.dart.deloitte.com). Having been conducting regular meeting in different countries, however, the G20 has not been able to set up a solid groundwork on how to prevent global financial crisis in the future. In spite of all the hard work that goes into the summit preparation, the actual focus of the gatherings is likely to be determined by any issues happen to be capturing the leaders' attention along the years. Moreover, it is not clear whether the remedy for global financial crises was because of the systematic approach formulated from the governments' agreement or simply because the peak of crisis was over and things began to return back to the normal equilibrium. And when the acute phase of the financial crisis was over, developed countries are obviously opted to return back to traditional international organizations such as the IMF and the World Bank, in which they have more prerogatives and controls.

It is fundamental, therefore, to consider what the G20 means for developing countries and for global governance in the future. G20 is definitely far from ideal with regards to memberships, mechanisms, and effective implementation of its agreements. However, although G20 has insofar failed to reached substantial agreements on fundamental agenda such as climate change and energy crisis, it has been able to provide functional communication among leaders and decision-makers during the financial crises. For some experts, G20 is a kind of necessary evil that we must tolerate (Bradlow, 2017) before the establishment of more inclusive and effective global governance. Emerging economies and less developed countries should not aspire for ambitious goals from the G20 forum, but there are rooms for extracting some value for more participatory and inclusive engagements.

The demands and expectations that G20 would take the lead in deepening the global agenda remain exist and members of countries, both from the developed and the emerging economies, remained sufficiently engaged. One would find that the "club nature" of G20 in global governance constitutes its weaknesses in terms of lack of binding rules and organizational fluidity in its operational mechanisms. Yet these unique characteristics can become sources of strength if countries are seeking alternatives for international arrangements. The absence of permanent secretariat and its rotating presidency ensure that no country could dominate the G20 agenda (Berger et al., 2019). The involvement of various engagement groups are also additional values that cannot be found in other formal establishments or international groupings. If the engagement groups can actually extend the formal agreements into more operational and collective actions in respective countries, that would be a significant progress for the more useful and sustainable policy impact.

THE TRILOGY OF PERSPECTIVES AND PRAXIS: GLOBAL HEALTH ARCHITECTURE, DIGITAL TRANSFORMATION, AND SUSTAINABLE ENERGY TRANSITION

The values of collective and inclusive collaboration among countries of both North and South hemisphere have been repeatedly stated in many G20 forum. Today, the world needs such values more than ever. As global pandemic has fundamentally affected nearly all aspects of human life—from health, education, working environment, to international trade—the

gap among the countries' capacity to cope with the crisis has been a real hurdle for recovery. As most countries are beginning to be able to control the contagion, the Indonesian organizing committee for G20 believes that it is the time for international communities to work together in regaining and promoting promote productivity, enhancing resilience and stability, and reaping a sustainable and inclusive economic growth.

Under the theme of "Recover Together, Recover Stronger", the Indonesian organising committee for G20 has stated three prioritized issues, namely: global health architecture, digital transformation, and sustainable energy transition. Having been struggling with Covid-19 pandemic for almost three years has taught a hard lesson that the quickly spread virus could only be contained if the governments and communities are working together to comply with social distancing measures, to collaborate in developing the vaccines, and to quickly distribute vaccines and medical equipment across the affected countries. The phenomena of digital divide has also taught us that technological gap can be a real fundamental threat to global justice and equal prosperity. The world economy is undergoing major disruption together with multi-faceted challenges of digitalization, leaving no option but adapt with faster pace of changes. And unfortunately resource and capacity of all countries, including those of the G20 members, are not shared evenly. Also, the issue of catastrophic climate change can be addressed only if countries and communities are working together to reduce the use of fossil fuel, coal and other carbon-dioxide emitting energy and replace them with solar, wind, hydro, and other renewable resources. There have been hopes that all these global issues can be addressed in the G20 forum.

The issue of global health architecture is actually ranging from the health industry, global health financing, and drug development and distribution. The unprecedented Covid-19 pandemic revealed just how deep are the structural problems at the international level, which partly explained why there have been waves of uncontrollable contagion in many parts of the world, including that of high income countries (Sarkees et al., 2020). In response to global health system inequality, Indonesia as Chair G20 country in 2022 proposes three priorities to build the global health architecture and governance (Antaranews, 2022). This proposal is based on a shared vision to address challenges and strengthen global health systems and partnerships for global health emergency preparedness and response

capacities (Leaders of G20 and other States, 2021). First, to emphasize the need for a global policy and instrument on health protocols that will ensure safe and standardized cross-border interconnectivity, be it according to one's vaccination status, testing results, or health status in general. Second, to work on genomic materials with a new initiative that includes genomic handling and data sharing. Preparing for the threat to global health in the future necessitates enhancing the genomic diagnostic skills and information platform. Third, to equalize and to expand the global resource for future pandemics and health crises, including the manufacturing center for genome response (i.e. vaccine production) and readiness for the future pandemic. These three elements have covered all the necessary formula for immediate recovery from the global pandemic. However, as we would argue, the root issue of global health architecture might not entirely be addressed by all pragmatic responses.

Given the fact that digitalization is disrupting many aspects of the economy in almost all countries, the second priority issue is related to the digital transformation. At the beginning of its development, the digitalization has disrupted media, radio, and television, which fostered easier access to information from various media, anywhere and anytime for consumers. The second phases of disruption was in retail and travel, including logistics, followed by foods and beverages, finance, and education. Slowly, all economic sectors would be disrupted, including automotive, property, and health services. It is predicted that all sectors and industries will gradually become digitalized because of the immense benefits (World Economic Forum Survey, 2021). Digitalization has the potential to enhance progress and prosperity that is more equitable. This is in part attributable to the flexibility in term of space and time, as long as access, literacy and/or digital talent are assured, especially for developing countries with large population such as Indonesia. Yet digitalization also has the potential to increase inequality unless proper anticipation are put in place. To that end, cooperation among G20 members plays an important role in creating enabling conditions that should make digital transformation foster recover together and stronger from the pandemic, both at the international and domestic level. This especially so considering the fact that some members of the G20 are digital pioneers. Nevertheless, the actual praxis on digital transformation is not only tell us with success stories but also all the sad stories about aggravated gaps

among the rich and the poor, socially divisive digital technology, and other challenges that must be responded invariably by the decision makers. That is why, documented cases from Indonesia as a representative of developing and emerging democracy are particularly relevant.

The third priority issue is energy transition, which conceptually is quite simple: the pathway to transform energy system from unsustainable fossil-dominated fuel to those that are more environment-friendly and more sustainable. It is also the way in implementing crucial mission to prevent or at least to optimally minimize inter-generation-transfer of externalities in developing energy system. Managing various challenges, especially in addressing a framework of energy trilemma (energy security, energy access/affordability and environmental aspect) is the key for success for energy transition. Each aspect has a target to be met. However, these three aspects are often conflicting with one another. The energy transition process is determined by multi variables involving a wide range of stakeholders. The transition is a gradual process as its intensity and speed are heavily dependent on the capability to manage the multi variables within the system. Such variables include source of funding, business and industry readiness, and technical detail on the energy network, both for renewable fuel and electricity. The challenges are unique to each country, even to each region. In Indonesia, for example, the dependence of electricity generating system on coal is a complex challenge. All decision makers understand the need to expedite the phasing out of coal powerplant should be carried out. But the pace for electricity system in absorbing collaborative use of roof-top photovoltaics is something that cannot be predicted. The Indonesian households are facing systemic and technical difficulties for installing photovoltaics for alternative sources of energy.

The transition to a low-carbon system is aimed at mitigating the climate change, a fundamental common goal that goes beyond national priorities as it is ultimately linked to the future of human life in the planet. As the chapters in Part-3 will explain, however, there are so many variables and factors that need to be considered when it comes to the policy implementation. It is necessary to give all international stakeholders a time to adapt to the dynamics, relationships, and various uncertainties of the new energy system (Mundaca in Anonymous, 2018). We all wish that the time for adaptation would not be too long as the actual impact of the climate change has been

experienced in many parts of the world. Cases of transition efforts towards sustainable energy from Indonesia is deemed as important contribution to the G20 forum to ensure that concerted actions among developed and emerging economies can be formulated and implemented accordingly.

STRUCTURE OF THE BOOK

After the preface section, the first part of the book contains four articles that are related to the issue of global health architecture. **Laksono Trisnantoro** explains that Global health architecture (GHA) is vastly expanded over the past few decades. Using industrial lens, the health sector has now become a global industry. In 2015 DFID found that the GHA condition had been crowded and poorly coordinated. Based on the current situation, there is a big expectation to G20 Movement for transforming the current GHA which emphasize more resilience and inclusivity for every country in the world to face the possibility of future pandemic. A stronger commitment to all people being healthy is needed. It is clear that, a new system for channelling resources from developed to developing countries, global public goods technology transfer, and international law reforms in pharmaceutical regulation are needed due to fix the strange and uneven relation between actors in global health architecture.

A similar argument is put forward by **Siswanto Agus Wilopo**. As countries work together to end the pandemic, we must draw on the lessons we have learned to help prepare the world for the next global health emergency by rebuilding global health architecture. A reform of the global financial architecture is needed. Developing countries deserve more and better financial support from the international community that is aligned with their needs. Strong political leadership, commitment, and domestic investments are equally critical. The Covid-19 pandemic has highlighted the importance of coordinated action in fighting global threats like pandemics and other similarly widespread crises by strengthening the global health system and advancing the health care industry.

On the issue of drug industry and development, **Mustofa** and **Dwi Aris Agung Wijayaningsih** write about the fact that discovering and developing a new drug is time-consuming, extraordinarily costly, and high risk, with very little chance of a successful outcome. As they explain about innovations conducted in all stages of drug discovery and development using

advanced biomedical science and technology. These all involve academia, pharmaceutical industry, and the support of government policy. Several strategies to solve the challenges in drug discovery and development were also proposed including the improvement of drug research and development (R & D) resources both in universities and pharmaceutical industry, strengthening translational research from the basic to clinical sciences, development of international collaborations involving all stakeholders, and focussing in development of unmet drugs need and drugs for new emerging diseases. With spirit to recover and rise together after Covid-19 pandemic, G20 countries should lead in implementing these strategies in order to enhance efficiency and productivity in drug discovery and development.

All countries need to increase the financing of health services in all aspects. If all international and domestic financing strategies are focused on the development of UHC (Universal Health Coverage), as argued by Siswanto Agus Wilopo, then most the countries will have better equity in their health services. Policymakers need to be realistic in the planning of programs and strategies which prioritize creating a resilient health system. Three priorities should be considered on this issue: investment in primary healthcare services, adequate funds for health promotion and disease prevention, and strengthen public financial management on health.

The second part contains seven chapters that are related to the issue of Digital Transformation (DT). It starts with a piece from **Sri Adiningsih** on digital economic transformation that has been changing many aspects of human life not only in develop countries but also in emerging economies. Taking the case of Indonesia, she explains that despite the challenges, there are positive factors that point to a robust development of Indonesian digital economy. Such factors include but are not limited to the overwhelming support and acceptable of Indonesians of the digital economy; the country's large population is at the peak of the demographic bonus; the digital savviness of the majority of the population, especially the young generation that is enthusiastic about digitalization; and support provided by government authorities to the development of digitalization. Besides, Indonesian consumers are quick to adopt new technologies and the fact that Indonesian are in digital life leaders compared to citizens of other ASEAN members. Such factors underscore the existence of strong factors to support

digitalization which will pave way for deriving all benefits it has to offer to society and economy.

Further explanation about the impact of digital transformation to the Medium, Small and Micro Enterprises (MSMEs) is presented by **Syaiful Ali**. A critical factor that distinguishes MSMEs' readiness for digital transformation is the extent to which digital technology is ready at the country level. The Network Readiness Index is one of the indexes used to assess the extent to which a country's digital transformation readiness can be used as a parameter of a country's digital transformation readiness. NRI data for the last three years shows the inequality between nations, for example, in the ASEAN region, and between countries in the G20. If this inequality is not addressed, it will cause the economic recovery process due to Covid-19 to be uneven. Countries with an adequate level of readiness for digital transformation will be better at improving their economy than countries with a lower level of readiness for digital transformation.

The necessity of governments to adapt with digital transformation was discussed in the next two chapters. **Wahyudi Kumorotomo** writes about issues on public policy, digital governance and digital public services in Indonesia. Disruptive environment has changed the context for public governance substantially. Unfortunately, many decision makers in developing countries failed to understand how things should be changed due to digital innovation in such disruptive environment. The role of government in using ICT and the new digital environment to provide better services for the society is fundamental in any forms of digital transformation. While explaining the government initiatives for digital governance in Indonesia, the author maintained that the basic issue on digital transformation is whether or not information technology would improve public services in the country. It is expected that the Indonesian experience might be referred to as a lesson for the G20 member countries, of which many are still struggling to formulate the best policy for harnessing the new digital environment in order to provide the best for the society.

Ahmad Djunaedi writes about the fact that digital transformation remains emphasizing on the use of information technology instead of understanding that it requires organizational change and business processes. He argues that the central government should develop, among other things: the integration policies digitalization, data integration, and policy

coordination. Local governments need the flexibility to innovate and to formulate the best strategy for transforming into digital governance. It would be fundamental that local governments have adequate leadership and commitment that that are crucial for planning, institutional development, human resource development, and change management while encouraging participatory approach for creating digital society and digital culture.

On digital society and digital literacy, **Hermin Indah Wahyuni** argues that inclusiveness towards a digital society requires a comprehensive approach at the upstream and downstream levels. Digital transformation may start with infrastructure development, but strengthening the ecosystem is much more essential. Political ecosystem needs to be strengthened towards a robust national vision so that a solid policy is formed and the business utilization of digital technology can be adequately facilitated. Also, the community ecosystem must be built through a vibrant strengthening of digital literacy. Digital transformation is a broad landscape that has extra dimensions and complex intra-relationships in ecosystems. The world national leaders should work together to unravel the problems, otherwise the digital divide and digital inequality will get deeper and wider.

A specific issue on the impact of digitalization on tourism industry is presented by **Muhammad Baiquni**. The chapter explains digital transformation in global tourism with special focus on recovery and resilience after pandemic Covid-19. The global pandemic has inevitably devastated tourism industry. However, it has also altered tourism industry with new ideas for sustainable tourism development and digital transformation as exemplified by the Go Digital programs. Digital transformation in global tourism may create disruptions and risks. But on the other side it also created new opportunities to work in more inclusive and equitable ways in producing more quality and sustainable tourism. It should be understood that tourism is a complex ecosystem with high diversity of actors and sectors involving national and local governments, several ministries and agencies, small and big companies, communities and private sectors. Each has their roles in playing certain function in such complex ecosystem. The government has pivot point role in conducting the orchestra of sectors and actors while the industry entrepreneurs are trying to innovate and to make actionable breakthroughs in providing alternative tourism services.

The case of digital transformation on education is presented by **Sri Hartati**. She explain that the concept is related to digital learning, academic environment transformation, new learning methods and smart education. In Indonesia, the e-learning prototypes has emerged in early 2000 and continues to grow today. It was then followed by the smart campus movement in 2017. Unfortunately, both of these movements are still emphasizing on the use of information technology instead of the ultimate goal of smart education. Most of decision makers failed to acknowledge that digital transformation requires a change in mindset and educational business processes. It is recommended that decision makers start to consider equal distribution of quality education across the regions, to create robust plans for smart campuses, to improve the change management for smart education, and to generate a digital culture.

Finally, the third part of this volume contains articles on the issue of Sustainable Energy Transition (SET). **Wangi Pandan Sari** explains how energy transition from fossil based fuels to renewable energy resources is central to addressing the threat of climate change. Strategies have been put in place and actions have been implemented to phase out fossil fuels and increase the use of renewable energy resources. However, in this current condition where we face severe global challenges from Covid-19 to the crisis in Ukraine, it is questionable whether the target set in the Paris Agreement can be achieved. The progress of energy transition is far from being on track, pressing the needs even more for countries to accelerate the energy transition agenda. There is an urgency for short-term intervention to address the current energy crisis. Such intervention should also be accompanied by and aligned with resolute mid and long term strategies of the energy transition as to meet the climate change goals. Accelerating energy transition is also vital to address energy trilemma, i.e. finding the balance among the three core dimensions of energy sustainability—energy security, affordability, and environmental sustainability. The writer than explains about the issue with the case of Indonesia.

Dwi Novitasari, Sarjiya, and **Deendarlianto** discuss about Indonesia's energy demand and supply from several sectors, such as the power generation, industry, and transportation sectors, all that is also related to the greenhouse gas (GHG) emissions in the country. Such analysis is expected to give a clear idea about what should be considered by the government, the private companies, and the community at large. The disturbing fact is

that although a country is bestowed with abundance supply of renewable energy, the demand is still on the fossil and mostly polluting sources of energy. It is obviously due to lack of commitment, the tendency to take an easy path of policies, and lack of collection and concerted actions on the parts of the society.

Therefore, it is important to understand how the commitment for renewable sources of energy is realized in the actionable praxis. **Deendarlianto**, **Samsul Kamal**, **Tumiran**, **Sarjiya**, and **Ekrar Winata** argue that, via the G20 forum, Indonesia has the opportunity to increase the readiness of country members to implement global energy transition through the G20 meeting. As part of its action plan, officially the Indonesian government has committed to achieving the energy transition by formulating a target of 23 percent energy mix by 2025 and committing to achieving Net Zero Emission (NZE) by 2060 or sooner. The availability of renewable energy resources and technological innovation will have an impact on reaching the renewable energy target and achieving Net Zero Emissions (NZE). Therefore, this chapter will use a Geographic Information System (GIS) to examine the availability and accessibility of new and renewable energy resources (hydro, solar, wind, and biomass energy) and the development of environmentally friendly technology for the electrical and household sectors in Indonesia (clean cooking stoves).

Ardyanto Fitrady argues that energy transition requires changing the behaviour of actors or agents of the economy including the government, private companies and community elements there are four main economic principles that must be considered: (i) It is driven more by policy than technology, (ii) It is disrupts the liberalization of the electricity market, (iii) It is meant to maintain economic growth according to the existing industrial structure, and (iv) Consumer preference for green electricity will change and will lead to changes in current demand and business models. This means that old business model in the electricity sector must change to respond to these changes. Therefore, the success of the energy transition is determined by the incentives received by each economic agent involved, both producers and consumers. Beside price intervention, the government might take regulatory approach in one of three forms: fiscal incentives, carbon tax, and cap-and-trade policy.

The regulatory analysis is elaborated further by **Mailinda Eka Yuniza** and **Irine Handika**. Given the pressing issue of global climate change, all countries are urgently need to enact laws on New and Renewable Energy (NRE). It is recommended that setting a zero emission target must be stated clearly so that it would legally bound. The government of Indonesia has ratified the Paris Agreement through Law 16/2016. Consequently, the next tasks are: (1) To increase the protection of the territories that are most vulnerable to the impacts of climate change; (2) To follow up the national commitment in reducing emissions with actual actions in forest conservation by expediting the use of renewable energy and encouraging the participation of local communities and indigenous peoples; (3) To encourage collective participation of all stake-holders and communities in the development of modalities, procedures, and guidelines for the implementation of the Paris Agreement on climate change; and (4) To expand the access for funding sources, transfer of technology, and capacity building for mitigating the actual impacts of the use of NRE.

To ensure that all the government regulations are implemented effectively, **Derajad Sulistyo Widhyharto** and **Maharani Hapsari** discuss about the importance of involving all the social and political stake-holders and the community at large. It is essential for the Ministry of Mineral and Energy Resources to scale up Indonesian progress in using renewable energy resources. By all means, Indonesia remains overly dependent on fossil fuel. Also, efforts are needed to strengthen cultural and institutional basis for the use of NRE beneficiaries. Taking the case from South Kalimantan, it is recommended that regional trade integration is fundamental. This aspect needs to be studied carefully to map the potential of national businesses to upgrade the NRE production chain. As an agenda that also involves contesting democratic political aspirations, the energy transition cannot be monopolized by one particular stakeholder's position and role nor can it be weakened by certain stakeholders. Awareness to open up social and political space for inclusive dialogue is a crucial foundation for Indonesia's sustainable energy transition.

Alva Edy Tontowi and **Bertha Maya Sopha** reiterate the notion that renewable energy transition requires collective and concerted efforts from diverse aspects, i.e., technology, economy, socio-culture, institutions, and governance. The chapter provides insights on the Indonesian industry

readiness to support the development of three renewable energies, i.e., solar, wind, and wave energy. It is unfortunate that for Indonesia, and probably for many developing countries, there are still many barriers to intensively use such sources of energy. Domestic industries have not yet been able to produce the required components entirely although the raw materials have been available in the country. For example, the current domestic component level of the PV (photovoltaic) module for solar energy in Indonesia is only 43% and that of the wind energy system is 33%. Hence, decision makers have to understand the issue from the perspective of supply chain in order to develop domestic industrial capability. The industry should be able to process supporting materials at the lowest possible cost so that the use of NRE would become more feasible alternative. Also, the government should provide financial incentives in the forms of the feed-in tariff, investment subsidies or tax breaks to domestic industries. A target of production capacity should be fixed with government regulation so that any progress for the use of NRE can be monitored accordingly.

As energy transition is determined by multi variables involving a wide range of stakeholders, **Rachmawan Budiarto** desribes that transition is a gradual process and its intensity and speed are heavily dependent on the capability to manage the multi variables within the system. The capability covers sources of funding, business and industry readiness as well as technical detail on the energy network, both fuel and electricity. These challenges are unique to each country. The writer also talks about how Indonesian dependence on coal for generating electricity is a complex challenge. Any efforts to phase out coal powerplant are related to collaborative networks for using electricity from roof-top photovoltaics. Aside from relatively expensive costs, there are still too many procedures and limitations for people who would like to install photovoltaics. Therefore, the concern includes government regulations, incentives for investment, and public campaigns for the use of New and Renewable Energy. The transition to sustainable energy needs bold commitment, intensive bargaining among stakeholders, and converging interests among various parts of the society so that new configuration of the energy system can be firmly established.

In the Epilogue, the editors provide important notes from the chapters and reflections on what have occurred in terms of global issues, what are the challenges ahead, and what kind of policy options and actions to be

undertaken in the future. Parallel to the three prioritized agendas for the G20, critical reviews on Covid-19 global pandemic, the changing economic activities and lifestyle, and the transition towards sustainable energy will be presented. We would argue that interdependency and partnership among countries are inevitable facts that have to be understood and acknowledged more than ever. Consequently, all the critical global issues—health, poverty, climate change—can only be addressed with collective actions of all individuals in developed as well as developing countries. The collective awareness of the new world order for healthy, smart, and green lifestyle is essential to the future living in the planet. Around 65 percent of the world population and 80 percent of the world economy are represented in G20 forum. If all the G20 leaders come up with agreements that are consistently implemented in their respective countries, such concerted actions would definitely have a substantial positive impact on any of the critical global issues. These are what we mean by collective and concerted actions.

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CHAPTER-19

TOWARDS SUSTAINABLE ENERGY TRANSITION

Rachmawan Budiarto

19.1 THE ENERGY TRANSITION PATHWAY

The energy transition is the pathway to transform energy system from unsustainable fossil-dominated fuel to a sustainable system. It is also the way in implementing crucial mission to prevent or at least to optimally minimize inter-generation-transfer of externalities in developing energy system. Managing various challenges, especially in addressing a framework of energy trilemma, is a key for success of the energy transition. The trilemma expresses a balance between energy security, energy access/ affordability and environmental aspect. Each aspect has a target to be met. However, these three aspects are often conflicting with one another.

The energy transition process is determined by multi variables involving a wide range of stakeholders. The transition is a gradual process in which its intensity and speed are heavily dependent on the capability to manage the multi variables within the system. The capability covers sources of funding, business and industry readiness as well as technical detail on the energy network, both fuel and electricity. These challenges are unique to each country, even to each region.

In Indonesia, for example, the dependence of the electrical energy system on coal is a complex challenge. Related to it is how fast the phasing out coal power plant can be managed. The concern includes regulatory and investment considerations. The speed of the electricity system in absorbing

collaboratively electricity from roof top photovoltaics is another example. The existing procedures applies limitations based on various variables, such as existing installed power in house having plan to install the photovoltaics. This represents a bold characteristics of the energy transition, namely intensive bargaining among stakeholders, who have various interests, trying to find out new configuration of the system. Therefore, this transition takes time to process gradually.

A sustainable energy transition is a long-term process. The transition to a low-carbon system has big targets of national and international priority. It is among the national interests to firmly manage this transition phase. Still, it needs to be carried out by also giving all stakeholders time to adapt to the dynamics, relationships, and various uncertainties of the new system (Mundaca et al., 2018).

The top-down approach from driven by government and the bottom-up initiatives powered by people should be in line. Energy initiatives at the local level, both in rural or urban area, will contribute to the development of a sustainable energy system with decentralization as one of its main characteristics. All stakeholders should work side by side to realise the sustainability goals of energy transition. In this regard, a shared vision is needed (Van der Schoor and Scholtens, 2014).

Perlaviciute et al. (2018) explains the need to recognize various concerns that develop in society. The transition phase should contribute sufficient opportunity to the stakeholders to collectively digest the various new things that arise. Various scenarios can be generated through a process of deliberation and harmonization that unites various narratives about an understandable future (Miller et al., 2014). This is important so that the various executed decisions do not cause injustice or a sense of injustice.

19.2 A PESTLE FRAMEWORK

Among the early steps to manage the energy transition process is to understand the external and internal context. A comprehensive analysis will reveal the opportunities and risks of the energy transition. It can also present the potential/feasibility and limitations/constraints in carrying out the transition. For this purpose Budiarto et al. (2020b) suggest a PESTLE Framework, which involves political, economic, sociological, technological,

legal and environmental aspects into comprehensive analysis on the transition.

Political Aspect. These factor are typically revolved around how and to what extend government and legislative body may influence the undertaking of energy transition. It includes development and reinforcement of policies related to coal mining and consumption as well as renewable energy resources. The effective affirmative policies to internalize the externalities of energy system could speed up the transition.

Economical Aspect. A systemic effort in advocating for energy transition should consider the economic aspect of the current energy system and how transition may affect stakeholders. Economic factors include economic growth, income generation, cost of living, investment, globalisation, etc.

Increase use of renewable energy resources encourages regency development, support business activities, develop new infrastructure, create job opportunities, and open isolated remote areas. They contribute to the region and national economic benefits, while decrease negative economic impact due to the externalities of fossil-based energy system.

Sociological Aspect. It is the aspect concerning the social environment of the region which includes cultural trends, demographics, education level, health consciousness, as well as career and business attitudes of the population that live there.

Recently, Indonesia is still in an early phase of energy transition. This early phase is represented by use of renewable energy, which often comes in the form of off-grid system. The renewable energy based system is often applied to increase electricity ratio in remote/isolated areas. For an off-grid system to operate effectively, it requires community engagement, commitment and capability in system operation and maintenance. However, not only for an off-grid system, people attitudes, believes, and values as well as capability are also vital for an on-grid system. It is the time to prepare sociological aspect also for the next phase of the energy transition, where there will be far more intensive use of various renewable energy technologies to support urban area in on-grid schemes.

Technological Aspect. This concerns with any technological advances that may affect the energy transition. Implementation of renewable resources to fulfil energy needs must be supported with technologies that are reliable

and cost-effective. Indonesia has enormous potential in various renewable energy resources. Though, which energy resources and technologies best suited for implementation will be different form regions to regions. Thus, an assessment should be made and tailored to the region. Furthermore, the readiness of the technologies should be considered as well. Related to the energy trilemma, it should be a top priority that Indonesia accelerates the systemic effort in increasing the capacity of national renewable energy at least to supply its own energy demand. The country could not change its status of a fossil importer to be an importer of renewable energy technologies.

Legal Aspect. These aspect relates with the government and legislative interventions, which usually overlap with the political aspect. The energy transition is regulated and bound by law and enforced in the effort to maintain fairness and wellbeing of the community. Furthermore, a set of enabling policies and related regulations is needed to increase support from financial support, strengthen affirmative approach to develop capacity on national industry as well as also optimal balance between centralized management of energy system and rapid increase of public/private role in energy transition.

Environmental Aspect. These factors become important due to global warming and the increasing need to shift from non-renewable to sustainable resources. The factors cover changes in climate, weather, carbon footprint, air pollution, and so on. The consideration to environmental aspect could affect, the growing coal mining activities that should be better managed so that they can decrease detrimental effects to the environment. It includes mining activities in supply-chain of battery industry as well. Moreover, effective realization of environmental aspect will determine speed and intensity of externalities internalization.

19.3 BENEFIT SUSTAINABILITY OF ENERGY SYSTEM

The system is focused on energy services, which are expressed as various benefits generated by energy carriers for the benefit of human life (Modi et al., 2005). Examples of energy services are heat for cooking, light for lighting a house or factory, mechanical power for grinding, communications, and others. Meanwhile, Lovins (2004) defines energy service as a function that is intended to convert energy in various devices. These functions contain

comfort, mobility, fresh air, accessibility, entertainment, electrochemical reactions, and so on.

From a macro point of view, energy is one of the determinants of the survival and development of a society through its ability to maintain various ecological processes, drive various economic activities and, in general, improve the quality of life. The intensity and sustainability of each activity are highly dependent on the availability and consumption of energy.

Realizing energy system capability to continuously deliver various benefits is among the top priorities. The benefits should be delivered without causing negative impact to various related aspects. These two variables of the system, which are capacity to continuously deliver the benefits with no negative impact, express a target of benefit sustainability which should be fulfilled by the energy system.

Especially for Indonesia as a country in early phase of energy transition, sustainability consideration is crucial. Large number of technological constructions in developing countries (note that Indonesia is not categorized as developing country anymore) did not work well according to the design time because of no adequate sustainability assessment (Pocock et al., 2016).

Sustainable development can be defined as a comprehensive process to maintain harmony between the natural and the artificial environment, as well as creating living conditions that uphold human dignity while encouraging creation of economic justice (Du Pleissis, 2002). To fulfill the sustainability aspect the renewable-based technology use needs to be well designed. In general, technology utilization can be called sustainable if it has ability to provide additional impact in various factors, such as, (1) access and quality of health, (2) community and institutional cohesion through participation, (3) the role of marginalized community groups, (4) unemployment and relative poverty, and (5) technical competence locally (Paas, 2012; Slaper and Hall, 2011; Koopmans and Koppejan, 1997). Moreover, it is clear that the sustainability criteria in applying the renewable energy based technology is met not only by fulfilling environmental sustainability aspect, but also satisfying technical, technological, social, economic, and institutional aspects.

Technological Sustainability. This aspect describes ability of the renewable energy technology in continuously supply electricity and/or fuel during its designed life time. It expresses reliability of the implemented

renewable energy technology. It can be realized by fulfilling standards during the steps of design, installation, commissioning, operation, and maintenance. Appropriate design could be managed by finding an optimal solution, which is a compromise on various variables, such as renewable energy resources, utilization purpose and scenario, market availability, technology quality, installation challenge, budget constraint, as well as capability to operate and maintain.

Social Sustainability. Community is not the object of technology and development. On the contrary, it becomes a subject who participates in managing technological developments which can later produce various benefits, which are not limited to financial benefits. From the initial planning stage, the community is inclusively placed in a strategic position in discussing, finding, and determining the various components and steps to be enforced.

In this phase many national and international programs in Indonesia apply renewable energy technology in an off-grid system. For the off-grid system to operate effectively, it requires community engagement, commitment and capability. It is also true for the next phase of energy transition, when there will be more renewable energy technology in on-grid scheme. Public participation can be inspired and more strongly driven by champions. The champions can advocate for the energy transition in the national or regency context. They may come from within the government and from public or civil society organisations as well as from business entities. Their existence is vital for the success of the energy transition process.

The systemic process to meet social sustainability needs at least six steps, namely, (1) ensuring the legality of land ownership, (2) involving local communities to actively participate from the beginning phase of design to the construction activities, (3) preparing designs by also following the local wisdom, (4) utilizing sustainable energy sources which are available at local level, (5) utilizing sustainable and affordable materials at the local level for construction and operation as well as (6) fulfilling quality standards that are generally applicable locally, while still referring to international standards (Pocock et al., 2016).

Without public acceptance and support, a sustainable energy transition will be impossible to be performed. Public acceptance is something that is not simple. It depends on the characteristics of the energy project, the

location of the program, and various psychological and social factors in general. This relates also to the need for social justice. In addition, public acceptance is dynamic, develops over time and can manifest in various forms.

In this regard, there is no single solution that can address this complex challenge. It is necessary to develop various options of solution to also gain public acceptance. Two-way communication is needed so that the role of the community can be adequately internalized into the policies drawn up. The inclusion of the role of society inherently in policy is critical to the success of the energy transition.

Unfortunately, although it should have been included in the planning process from the start, public acceptance was often managed not in a proper resource plan and schedule. Engineers, policy makers and program developers tend to misjudge the complexity and causes of public resistance (Perlaviciute et al., 2018).

For this reason, it is necessary to consider more humanizing energy policy (not dominated by techno-economic considerations). This will position the energy into productive discourses that are built on various sides of human experience, social identity, and meanings that are believed by the public. There needs to be a balance of adequate participation, respect for alternative positions, and a feeling of inclusion among various stakeholders who come from very different backgrounds and experiences with energy (Miller et al., 2014).

Economic Sustainability. The use of renewable energy technologies should be managed to drive sustainable economic benefit in various levels. The renewable energy technologies can provide direct benefits in the form of electricity cost decrease, which is enjoyed especially by business actors. If this is well performed, this decrease in energy expenditure, for example, will not only benefit business actors but also be useful for the surrounding community. A certain part of the saving in energy can be managed by the community. The savings can later be allocated for the purpose of operation and maintenance including purchasing spare parts for replacing of the renewable energy system is damaged. Before being used for the purpose of maintaining the energy system, the savings can be also allocated to support various business activities.

In addition, new businesses will emerge that will become an additional source of profit. These businesses include ones that directly provide various products and services related to the renewable energy or ones that are supported by the renewable energy. Moreover these growing new businesses will open wide opportunity for new green jobs in various occupancies.

Institutional Sustainability. Optimum institutional support is needed to increase the role of renewable energy technology with its ability to provide benefits. The institution can play a role in optimizing the potential of various resources. This role includes mobilizing and managing funding, improving and utilizing human resource capabilities as well as building various agreements needed to develop and implement various regulations.

In increasing use of community-based renewable energy, both in rural and urban areas, the role of local institutions becomes very important. For example, local financial institutions will be able to provide financial services as well as technical and management assistance. Vocational schools or other training/educational institutions around the site can build community skills and knowledge. Furthermore, local institutions that are initiated inclusively will have much more potential to survive because they rely on pre-existing social capital. In the future, this local institution will continue to develop in facilitating the increasing role of renewable energy.

Environmental Sustainability. Utilization of renewable energy will reduce CO_2 emissions. This strategic achievement is not only macro in nature, but also has an implication at the micro/local level. This becomes important in the midst of the increasingly clear various negative impacts of CO_2 emissions. The ability to reduce and prevent CO_2 from renewable energy investment decisions can be calculated quantitatively.

Meanwhile, the intersection of energy transition with circular economy also has the potential to be an additional solution to the growing waste problem. This can be found in the development of renewable waste-based energy production systems.

19.4 DECENTRALIZATION AND DEMOCRATIZATION OF ENERGY SYSTEM

Interestingly, the energy system transition offers a unique opportunity to provide solutions to various problems, as described by Budiarto et al. (2019). Miller (2014) writes that this transition has the potential to broadly improve

justice-related matters. Energy geopolitics has so far been influenced or driven by an expectation of scarcity, the notion that oil and gas reserves are limited, as well as that global demand increases so that the competition for what is left will become more intense. Meanwhile, various analysts point out that global demand for fossil fuels such as oil and natural gas will begin to decrease long before supply decreases significantly, as countries take strategic steps to reduce greenhouse gas emissions (Klare, 2015). At a time when the use of renewable energy far exceeds fossil energy, the geopolitics of renewable energy will receive strong attention. This is related, among others, to raw materials, supply chains and technology (O'Sullivan et al., 2017). The accelerating use of renewable energy technologies triggers a global energy transformation with far-reaching geopolitical impacts. The new energy age would cause significant reshaping on relations between states and communities and bring about a "new world" of power, security, energy independence and prosperity (IRENA, 2022a).

Currently, the energy system is generally supported by various large and centralized power plants and oil refineries. However, as a result of the non-centralized nature of the availability of new and renewable energy, the transition will show a new form that will be more common, namely a distributed system.

In many cases, in this distributed system the energy conversion units will be located close to the energy consumers. The energy consumers will be able also to become energy suppliers at the same time. There will be energy conversion units that are smaller in size than what is common today. Consequently, this distributed system will encourage not only the distribution of technology, but also the distribution of competence, ownership, decision-making ability and authority as well as responsibility in energy supply. This transition includes various political, economic, social, and technological dimensions, depending on the nature and degree of decentralization (Alanne and Saari, 2006).

The increasing role of renewable energy encourages a new equilibrium. It can be seen that system decentralization will occur and gradually increase at various levels: local, national, international, and even global. The expansion of renewable energy use, which are also run by community initiatives, has broadened the pool of energy stakeholders. Decentralization which was initially limited to this physical aspect (e.g. in the spread of

power plant locations) unfolds an interesting development, namely the democratization of the energy system. This democratization is described with various meanings and limitations and is also addressed with various responses.

There is still no established definition of energy democracy. Though, it expresses consistently a concern about who controls the means of energy production and consumption (Jenkins, 2019). Energy democracy brings energy resources under public or community ownership and/or control. It is a key aspect of the struggle for climate justice and an essential step toward developing a more just, equitable, sustainable, and resilient economy (Fairchild and Weinrub, 2017). While the first wave of energy democracy can be seen as demand- and consumer-focused, the ongoing second wave is shifting attention towards supply and production, or the energy system governance (Tomain, 2015). Szulecki (2018) emphasizes the characteristics of governance in energy democracy. It should be characterized by wide participation of informed, aware, and responsible political subjects, in an inclusive and transparent decision-making process relating to energy choices, with the public good as its goal. A high levels of ownership of energy generation and transmission infrastructure through private, cooperative or communal/public means are necessary. In general, there are still differences in departure points and nuances in meaning, as well as objective in political systems, varieties of capitalism etc. (Stephens, 2019). This energy democratization causes tensions between municipal authorities and central governments (Emelianoff and Wernert, 2019).

19.5 INTERDISCIPLINARY CHALLENGE

Currently, Indonesia is in a phase to prepare an accelerated increase of the renewable energy share in its energy mix. In the early phase, the country applies various renewable energy electricity technologies in two main categories: (1) the on-grid schemes, which is dominated by the business scheme to increase renewable-based capacity of PT PLN and (2) the off-grid schemes, which is dominated by the effort to increase the electricity ratio, mainly in rural and remote areas.

Many cases in the early phase show lesson learned to be elaborated for a better further phase. Novitasari et al. (2020) conducted analysis on a case in Karimunjawa District, a small islands located north of Java Island Indonesia.

Solving the problems of renewable energy development in the district is not only the task of the local government. It is also the task of the regional and central government. The study presents an example of the problems, which was caused by an unclear legal status of assets for centralized photovoltaics powerplants on Parang and Nyamuk Islands as part of Karimunjawa. Moreover, the local stakeholders had no adequate information who will be responsible to handle disruption or failure of the system.

Furthermore, the case study reveals four challenges faced for electricity management in the islands. First, the development of renewable energy needs to be accompanied by ability in using the delivered energy for productive purposes. Second, the collaboration of related parties is needed, such as community, government, academics, etc. Third, technical, social and economic assistances should be carried out in the pre-project phase, during installation and after the installation of the system. Fourth, community engagement in the management of renewable energy in the islands is indispensable.

Another study conducted by Budiarto et al. (2020a) in Sinarlaut Village, which is located in Agrabinta District, Cianjur Regency, West Java Province. The community is mainly farmers, and some cooperatives produce palm sugar from coconut tree sap. The farming activities produce various agricultural waste. One of them is a plentiful rice husk. This study performed a feasibility analysis focusing on implementing gasification technology to support palm sugar small industry. It was conducted not only on the technical aspect but also on the multi-variable sustainability aspect.

The study described multi-variable challenge in implementing the gasification technology in the village. A cross-sectoral involvement of local stakeholders is required to deliver a comprehensive solution. They include (1) the role of village government and local community institutions at the village, hamlet or village level for initiating the social engagement, (2) the role of local industry, workshop, or machinery and equipment shops, as well as the adjacent technical education institution to support need of supply and maintenance, (3) local industrial and farming activities for supplying biomass waste as fuel, and (4) the role of small and medium entrepreneurship (SME) to adopt the gasifier technology.

As part of the energy transition, increasing role of the renewable energy, which drives decentralization and even democratization of energy system,

is a complex challenge. This challenge cannot be responded to by a single-disciplinary approach. It involves many variables that influence each other. The complexity is found in various levels of the transition. A breakthrough is needed to get a new perspective which in turn leads to innovative real actions. Various challenges of energy system development, which can be seen more and more in this era, can only be answered with a transdisciplinary approach. This approach allows the development of a program framework with characteristics beyond the disciplinary perspectives.

In an academic context, Stock and Burton's (2011) description, which was compiled from nearly 100 literatures, explains the meaning of multidisciplinary, interdisciplinary, and transdisciplinary in research on sustainability as well as the differences between the three. With a multidisciplinary approach the researchers and various other stakeholders aim to share knowledge and compare the results of various studies. However, there is no attempt to cross boundaries or build new integrative knowledge. Researchers in a team that is built for running a certain project can contribute to giving each their own professional perspective on a particular theme/problem. As it does not carry out an iterative research process, the focus of a multidisciplinary approach on problem solving is not as strong as an interdisciplinary or transdisciplinary approach. In this approach, the iterative process is the formulation of questions in one discipline and submitted to other disciplines in order to solve a problem, which then raises new questions for other disciplines. Through interdisciplinary and transdisciplinary approaches researchers will be able to overcome differences and explore synergies. However, the multidisciplinary approach is limited to provide diverse opinions from various experts.

The interdisciplinary approach can be considered as an improvement over the multidisciplinary approach. The interdisciplinary approach focuses on addressing systemic problems "in the real world". This forces those involved in research, who come from various unrelated disciplines, to cross boundaries to build new knowledge. The need to bridge these diverse viewpoints from different disciplines stems from the need to solve complex problems involving the intersection of humans and nature. In the interdisciplinary approach, integration between natural and social scientists is a common practice.

Meanwhile, transdisciplinary is the highest form of an integrated project. This form involves not only multidisciplinary actors, but also non-academic parties (e.g. landowners, user groups, and the general public). This is done by combining an interdisciplinary approach with a participatory approach. Transdisciplinary research can be identified by its characteristics in the form of a collaborative process between researchers and non-researchers in a real problem and a combination of research with decision-making abilities by various stakeholders.

In order to build a holistic perspective through a transdisciplinary approach, the researchers involved must strive to find various options for thinking and even to overcome the chauvinism of the single discipline of these researchers and build openness to the perspectives of other disciplines. Through this holistic perspective, a fusion between various intellectual boundaries can be carried out in order to build new disciplines to answer real challenges. The aim of the transdisciplinary approach to build new disciplines and theories is what distinguishes it from interdisciplinary. The transdisciplinary approach emphasizes a holistic nature, which increases the participation of various stakeholders.

The energy transition stimulates a systemic process towards a new equilibrium wide range of stakeholders. This inter- and trans-disciplinary challenges should be managed in various angles of sectors which drive the energy transition. It means also a well-orchestrated program in all involved fields of effort in various levels: academic, research and development, industry, business, government, and others.

19.6 ACCELERATED CAPACITY INCREASE OF NATIONAL RENEWABLE ENERGY INDUSTRY

One of three pillars in the energy trilemma, which is energy security, demands ability of a country to fulfil its energy need under any circumstances. It includes the country power to diversify the energy supply in its energy mix and minimize its dependence on energy imports. These energy imports consists of fuel, technology, and human resource. However, currently Indonesia still faces the challenge of the relatively low ability of the national industry to meet the need for renewable energy technology. As consequences, the import component of renewable system is still high. It is necessary to carry out a comprehensive effort to prevent the transformation

from dependency on oil import to dependence on importing renewable energy.

To overcome this problem, it is necessary to increase the capacity of the national renewable energy industry. This capability needs to be improved in all parts of the renewable energy supply chain, with a clear step and time framework. The production capacity target could be started from relative simple components with growing feasible market. It could be then increase to capability target in producing sophisticated yet strategic component of renewable energy technologies.

Moreover, many countries can enjoy broad benefits of renewable utilization in job creation: manufacturing, project development, sales, distribution, construction, installation, operation, and maintenance. It will be true only in an enabling environment including strong capability of national energy industry.

In an effort to strengthen parts of the renewable energy supply chain, it is interesting to consider vocational high school (VHS, Sekolah Menengah Kejuruan—SMK). It is an education institution that educates individuals as student to be skilled workers who will be employed in the industrial, commercial, and service sectors (Kacan, 2015). In Indonesia, VHS provides a formal vocational education focused on various expertise programs such as mechanical engineering, electrical engineering, automotive, and others (Suharno et al., 2020). The further direct study of VHS students at the higher education level is a polytechnic and diploma program.

There are at least two majors in VHS which have strong relevance to the renewable energy, namely electronics engineering and electrical engineering. There are 1613 VHSs in these two majors in Indonesia (Budiarto et al., 2021). The curriculum of VHS in these two majors could provide a solid foundation for accelerating the provision of reliable human resources in the department of a certain renewable energy industry.

Affirmation for VHS students and graduates needs to be provided to further strengthen the national renewable industry. It can be realized systemically not limited to skilled labour provision but also to increase the production capacity of various components of renewable energy system. Many VHSs already have laboratory/workshop facilities that are suitable for teaching/training. The technical and management capacity of these facilities can be upgraded to develop centres for repairing and producing

various components, such as components of the photovoltaics system, micro hydro-powerplant, and others. Production activities can be on track with, for example, inverters and controllers of a specific size for the photovoltaics system. This could be developed as production unit which is integrated with the business line of the state-owned enterprise. Furthermore, the VHS-based business unit could also play important role in accelerating renewable energy development and its related business activities in province level.

A well-orchestrated policy and its implementing programs of, for at least four Indonesian ministers: (1) Ministry of Education, Culture, Research and Technology; (2) Ministry of Manpower; (3) Ministry of Industry as well as (4) Ministry of State-Owned Enterprise could provide a strong supportive environment to integrate VHS into the renewable energy supply chain. The support could be delivered also by private and banking sectors. The local government has also capability in to develop VHS-based renewable energy business schemes.

19.7 MANAGING THE DISRUPTION IN ENERGY SYSTEM

The energy transition opens opportunity to provoke trends that having disruptive impact on energy system. Among the trends showing the disruptive implications are as follow:

1. the growing decentralized system which drives growing interest in energy democratization (see for example Szulecki and Overland, 2020);
2. the growth of innovative business models which change not only the way of energy-related business but also the landscape of its player, role sharing and competition (see for example IFC, 2019);
3. the rapid development of numerous innovative and game-changing renewable energy technologies, including for example the hydrogen (IRENA, 2022a), the virtual powerplant (IRENA, 2022b), and a space-based energy harvesting (Chen et al., 2019);
4. wider and deeper integration of energy system into the online system, which not only opens many new benefit opportunities but also cyber-security-related risks (see for example WEC, 2019).

Various renewable energy technologies are considered disruptive due to their significant changes in the grid, business models, and regulation simultaneously (Johnstone and Kivimaa, 2018). More general, Rosenbloom

(2019) describes how the disruption causes a power shift from incumbents to new entrants or actors from other socio-technical systems. Furthermore, Johnstone et al. (2020) offered an analytical framework identifying four dimensions of disrupted system: (1) technology, (2) ownership and actors, (3) markets and business models, and (4) regulation. The first dimension relates to the different way new technology operates compared to existing established technologies, and how their novel characteristics pose potential problems for existing technologies and associated systems (Bower and Christensen, 1995). The second dimension describes various distributed actors beyond firms. It focuses on their different strategies and resources, and how new ownership models may come to challenge incumbent forms of ownership (Farla et al., 2012). The third dimension highlights a change in the dominant business models that can provoke radical effect on the market shares of incumbent companies (Christensen and Raynor, 2003). The fourth dimension is about the disruptive innovation that may give raise to significant public policy concerns and stimulating demands for new forms of regulation (OECD, 2015).

This disruption entails a significant transformation of stakeholders' role. The study which was conducted by Fitrady et al. (2021) shows a strong demand on the transformation. A comprehensive approach which is performed and supported by orchestrated stakeholders' action is needed to manage the disruptive system development to intensify internalization of energy system externalities, while broadening the stakeholders spectrum enjoying benefits from the sustainable energy transition.

Central Government. The effort to increase the role of renewable energy for energy transition demand a systematic, affirmative approach. It is enforced as a collaborative action amongst ministries. The government also has the responsibility to create a dynamic harmony among all related stakeholders in the energy transition. It is worthy of being mentioned that these stakeholders have competing positions in several cases, especially those having strong background in political and economic interests. A clear executive agenda within long-term national interests and capability to realize this agenda will be essential to mitigate this challenging issue.

As the trend includes the progress of numerous disruptive technologies and approaches, it is the strategic role of central government to build strong support for research and development program and its link with the

industry. This support is a part of the required systemic effort in managing the challenge of the energy trilemma in this energy transition phase with its increasing disruptive impacts.

Local Government. The local government plays a vital role in the energy transition in the provincial and regional levels. Together with the regional legislature, the local government can formulate and enforce regulations that aim to create an environment that optimally supports the development of renewable energy.

Various policy and regulatory options can be explored and then implemented to increase role of community or private sector. Many options of regulations are available to be considered, such as the obligation to install solar power on the roof of certain types of commercial building prior to issue of a construction permit or operational permit. The local governments can also be a champion by setting a bold example to the community for cleaner and more sustainable energy. Regional budgets can be allocated to achieve it, for instance, by installing the PV system in government buildings and public infrastructure. This budget is also used to run adequate operational and maintenance activities.

Furthermore, by increasing strategic affirmations, the local governments can grow different local companies running innovative business models in renewable energy. Integrating all stakeholders having capabilities to play active roles opens broader opportunities to harvest the benefits of the renewable energy. The benefits includes green jobs that are available for local people.

Legislative Institutions. The legislative institution at all levels possesses the authority and capacity to integrate renewable energy into the political agenda and then various laws and regulations. Therefore, it occupies a critical role in the energy transition. Among the anticipated expanded role is its strong collaborative strategy with the government to support the national renewable energy industry. This can be applied by giving stronger legal affirmative policy for national players to supply service and good without jeopardizing their growing competitive capability. The legislative institution is also a vital player in harmonizing stakeholders dynamics in their transforming business strategy and culture. A legal and political approach will be essential to mitigate competing interests among stakeholders to produce positive results.

Banking/Financial Institutions. Among the biggest challenge is providing a strong financial support for a wide range of programs in the energy transition. The support is needed mainly to build new renewable energy systems, to modify fossil energy based infrastructure and to develop supporting industrial system. It is also required to modernize the energy system which should now have solid capability to absorb the supply from decentralized renewable energy stations and to mitigate various new risks related to cyber-security.

It is also important to deliver additional push encouraging banking/ financial institutions to reduce their support for energy projects having intensive negative externalities. This would also increase the fairness of playing field for renewable energy technologies in their competition with fossil-energy based technologies.

Large Scale Business in Fossil and Renewable Energy. Large scale business in the fossil energy sector enforces strong influence to the energy transition. These fossil-based enterprises can play an essential role by transforming their business strategy and culture into a sustainable energy system. One of the biggest challenge is internalizing various existing externalities in its business process.

Moreover, their vast capital and network strength could provide significant support to various parts of renewable energy supply chain. Embracing the smaller players into their business in an optimum mutual benefit scheme is a strategy to be elaborated.

Various innovations including even business model disruptions continue to develop in line with the increase in renewable energy utilization with its different technological configurations. By properly adapting its business model, the enterprises have promising opportunities to grow. It is also a bright prospect for skilled labour to fill this opportunity. The business sector could increase its capacity to create comprehensive and long-term benefits, such as decreasing technology imports and providing new jobs.

State-owned Enterprises (SOE). There are at least three important clusters of SOE regarding energy transition: (1) energy, oil and gas industries, (2) mineral and coals industries as well as (3) banking industry. Like other enterprises, the SOE can play a significant role by transforming the business strategy and culture into a sustainable energy system. Having also the mission to fulfil a set of government targets in the energy system,

the SOE could have even more substantial power to increase the speed and intensity of the energy transition. For example, PT PLN, which is state-owned enterprise in electricity, can significantly reduce the capacity of coal power plants, move faster to renewable energy and open more widely access for renewable-energy based electricity supplied by private sector and community.

The significant transformation of the energy infrastructure is needed in managing this transition or even disruption on the energy system. The questions to be answered include capability of the electricity and fuel supply chain in absorbing the supply from the private sector and community. The progress in technology development provide better opportunity for renewable-based electricity, biofuel and hydrogen which be produced and supplied the private sector and community. The role played by the SOEs could be a key factor for the intensity and speed of transformation on the energy infrastructure. This also expresses real affirmative policy of the central government.

Local Business Institutions. The government and many donor agencies currently promote public-private partnerships or other collaborative schemes for using renewable energy in the regions. Cooperative and regionally owned enterprises (Badan Usaha Milik Daerah—BUMD) can be an active player in these business schemes. Furthermore, local business has a greater opportunity in this increased initiative by running new business models based on renewable energy. It can be managed by inclusively involving local resources. The active role of this local institution can ensure significant local benefit resulted from decentralized renewable energy system. It will also realize the inherent characteristics of renewable energy in local community engagement and welfare.

Local Communities. In general, the existing energy system gives the local communities a role merely as energy consumers. Energy providers should fulfill their energy demand in one way flow of energy. However, in the future, a significant transition will encourage the local communities, both in rural and urban areas, to also play a role as energy producers. The local communities have a key role in achieving sustainability of energy infrastructure, which is operated not only by big business players. In this new era, therefore, local communities will have the opportunity to be prosumers.

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