



CHAPTER 25

**INDONESIA'S STRATEGIES IN DEVELOPING
COVID-19 VACCINE: FROM THE PERSPECTIVES
OF MODERATE VACCINE NATIONALISM,
VACCINE SCIENCE DIPLOMACY,
AND SELF-RELIANCE**

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Abstract

The COVID-19 pandemic that emerged in early 2020 has transformed the global political landscape. This is due to its significant impact, notably which resulting the highest death toll compared to previous global pandemics, like Spanish Flu in 1918. Preventing more devastating consequences, most international actor, either state or non-state, have made their best efforts to combat the pandemic. One crucial initiative during the health crisis is by developing COVID-19 vaccine. Indonesia is one of the countries that actively initiating breakthroughs in doing so. Although it was not ambitiously pursuing to be among the first country to find the vaccine, but as middle power country, Indonesia has persistently attempted to make innovations, including establishing 6 frameworks for the development of the COVID-19 vaccine. Among the six schemes, five of them are national research-based activities conducted by universities and research institutes; meanwhile, there is one project that representing a collaboration between Indonesia's state-owned pharmacist company, Biofarma and Baylor College of Medicine (BCM), United States. Therefore, this paper analyzes Indonesia's strategy in developing COVID-19 vaccine. The approach used in this study is multidisciplinary referring to medicine and international relations. The theoretical frameworks that employed in this paper are including vaccine development, vaccine nationalism, vaccine science diplomacy, and self-reliance. Therefore, this paper argues that Indonesia focuses on, first, moderate vaccine nationalism which encourages the country to start domestic vaccine development. This becomes Indonesia's general approach to develop vaccine during Covid-19 pandemic. Second, Indonesia collaborates with other foreign actors through vaccine science diplomacy as inevitable path to establish new national architecture of vaccine production. Third, Indonesia applies self-reliant approach because it is feasible for Indonesia to develop COVID-19 based on its own capacity.

Keywords

*Covid-19 Vaccine, Indonesia, Self-Reliance, Vaccine Development,
Vaccine Moderate Nationalism, Vaccine Science Diplomacy*

Introduction

Similar to all countries in the world, Indonesia was also significantly influenced by COVID-19, when the virus broke out the first time in early 2020. According to ASEAN Report (2022), Indonesia has the highest death rate in ASEAN countries, with the second largest percentage of fatality rate after Myanmar. The fatality rate was particularly worsened when Indonesia hit by Delta—the severest COVID-19 variant, during June-July 2021. Indonesia had the second largest fatality rate in Asia due to the case (BBC, 2022). This health crisis eventually brought Indonesia into the brink of economic recession.

In overcoming the COVID-19 crisis, Indonesia had to ensure the availability of the cure which was referring to vaccine. The pandemic led to the country's great lost since Indonesia had not yet established vaccine industry. Prior, only developed countries that dominated the production for vaccine. This condition has been continued until the early period of COVID-19, when most of wealthy countries were rapidly developing, producing, and securing their COVID-19 vaccine; while most of developing countries or low, medium income countries were having problems to provide adequate vaccine for their population (Signé, 2021). Amidst period of global pandemic, vaccine is considered as game changer for the world.

Therefore, Indonesia was among a few developing countries which had the initiative to develop of COVID-19 vaccine. According to Kumraj et al. (2022), only few middle-income countries, that are actively involved in vaccine development and manufacturing. Indeed, it is very difficult for them as it requires advanced technology, innovation, and capacity-building. So far, only small number of countries that have policy to develop policy. Some of them are those which become the members of Developing Countries Vaccine Manufacture Network (DCVMN), like China, Russia, India, Indonesia, Brazil (DCVMN, 2021). In practice, national vaccine development which usually conducted by developing countries must be supported with production facilities, equipment, life cycle management, intellectual property (IP), product portfolio management and process development, as well as process maintenance (Kumraj et al., 2022). These aspects portray a strong, robust, and comprehensive vaccine production architecture, which lead the countries to have sustainable vaccine life cycle in global market.

In the context of Indonesia, it has officially announced the initiation of COVID-19 vaccine development by issuing Presidential Decree No. 18 of 2020 on September 3, 2020. The decree aims to establish the national team for accelerating COVID-19 vaccine development. Previously, Indonesia only relied on foreign industrial pharmacies to earn COVID-19 vaccine for its 279 million population which of course requires an abundant national budget.

According pandemic condition in Indonesia, the option producing national vaccine to provide immunity for its population eventually became very urgent. The decision was so inevitable due to several factors: first, the significant number of cases and casualties happened in the country. As mentioned before, Indonesia has experienced severe situation due to COVID-19, both in term of cases and mortality rate. Second, with a very large number of population and acknowledged as the fourth largest population in the world, Indonesia had to encounter problem related to insufficient quantity of vaccines. With the emergence of new disease where the vaccine is still on trial or in clinically testing period; there is an intention that most countries attempt to ensure vaccine availability only for their own populations, known as vaccine nationalism. Third, the uncertain condition where no one could predict the ending of the pandemic, so it has forced Indonesia to continuously purchase these vaccines—regardless an extreme increase of budgetary allocation. At this point, there is no other better option to do, except by only producing the vaccine domestically.

However, like other developing and emerging countries worldwide, the possibility for Indonesia producing and manufacturing its own vaccine is not easy. The issue is considered a challenging endeavor, especially related to Indonesia's lack of capability to independently manufacture vaccines including to combat previous diseases, for instance polio, meningitis, dengue fever, malaria, and tuberculosis (Anonymous Interview, 8/8/2023). Despite Indonesia's existing vaccine research initiatives and pharmaceutical state-owned enterprise (SOE), the country's current vaccine capabilities remain limited (Surianta & Patunru, 2024), although some of the capacities exist, yet referring to fill and finish approach (Anonymous Interview, 8/8/2023) which merely focus on importing the vaccine and distributing it domestically.

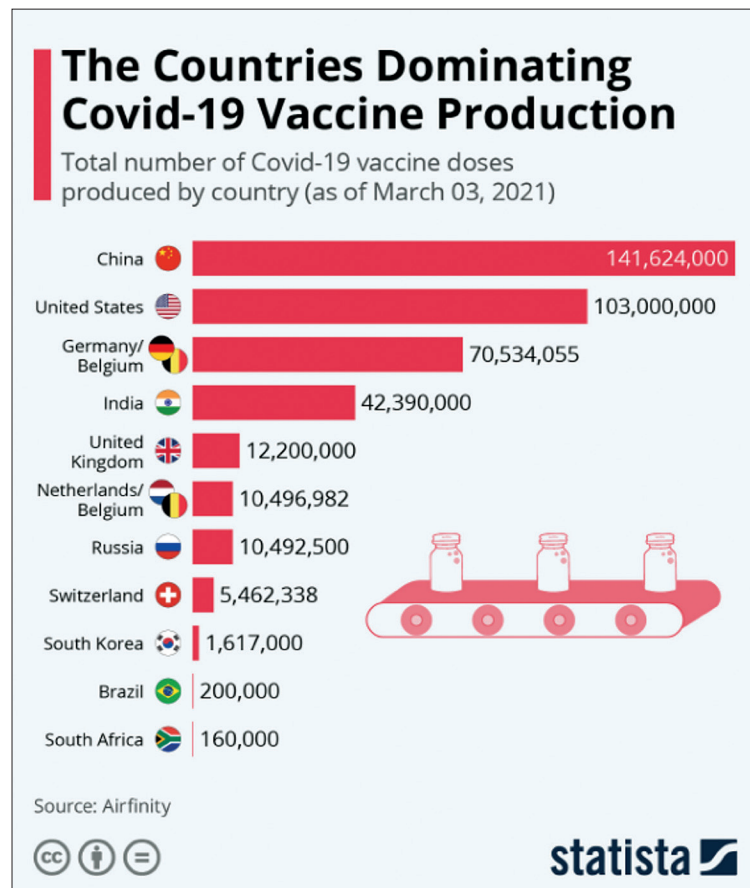
Table 1
 Leading COVID-19 Vaccine (until August, 2022) (Council of Foreign Policy, 2022)

| Country | Developer | Clinical phase | Efficacy | Doses | U.S. emergency or full approval |
|------------------------|----------------------|----------------|----------|-------|---------------------------------|
| China | CanSino | 3 | 58%–92% | 1 | |
| China | Sinopharm | 3 | 78% | 2 | |
| China | Sinovac | 3 | 51%–84% | 2 | |
| India | Bharat Biotech | 3 | 78.0% | 2 | |
| Russia | Gamaleya | 3 | 75%–92% | 2 | |
| United Kingdom, Sweden | Oxford-AstraZeneca | 2 and 3 | 74%–100% | 2 | |
| United States, Germany | Pfizer-BioNTech | 3 | 91.0% | 2 | Yes |
| United States, India | Baylor, Biological E | 3 | 90%+ | 2 | |
| United States | Johnson & Johnson | 3 | 64%–72% | 1 | Yes |
| United States | Moderna | 3 | 93%–98% | 2 | Yes |
| United States | Novavax | 3 | 90.0% | 2 | Yes |

Note: Efficacy can depend on dosage, severity of infection, and COVID-19 variant.
 Source: New York Times.

COUNCIL OF FOREIGN RELATIONS

Figure 1
 COVID-19 Vaccines Producers Based on States (Statista, 2021)



Beyond all the challenges, the Indonesian government is considered steadfast for its efforts to develop the COVID-19 vaccine. As Indonesia becomes one of the emerging countries that allocate significant investment on vaccine production, together with China, India, Vietnam, Thailand, South Africa, Brazil, Mexico, Argentina (Majeed & Mohyuddin, 2021), the country then attempts to eventually establish six COVID-19 vaccine development schemes (Coordinator Ministry for Human Development and Culture 2022) to combat the pandemic. These schemes consist of:

1. PT. Biofarma (pharmaceutical SOE) with Baylor College of Medicine (BCM),
2. Universitas Airlangga (Unair) with PT. Biotis (national private pharmaceutical company)
3. Universitas Indonesia (UI) bersama PT. Etana (national private pharmaceutical company),
4. Bandung Institute of Technology (ITB), Eijkman Research Institute, Indonesia's Research and Innovation Agency (BRIN) with PT. Biofarma,
5. Universitas Padjajaran with PT. Biofarma,
6. Vaksin Nusantara

The six schemes mentioned above are collectively working under the governmental authority, the so-called "Vaksin Merah Putih Consortium Project" (Red and White Vaccine). According to the actors involved, most of these schemes are based on Indonesia's independent capabilities. This means that Indonesia strives to develop and manufacture vaccine autonomously by relying to its research institution, universities, and pharmaceutical industries either state-owned or private. However, there is one research project involving a US university, Baylor College of Medicine (BCM), to support the national vaccine development program with PT. Biofarma.

Indonesia's vaccine objectives have finally implemented when there are two vaccines that have been successfully developed, Indovac and Inavac. Indovac is the result of strategic collaboration between PT. Biofarma and BCM and officially introduced on October 13, 2022. Meanwhile, Inavac, is second variant of COVID-19 vaccine that developed by Universitas Airlangga in collaboration with PT. Biotis, a private national pharmaceutical corporation. The vaccine has received a status of Emergency Use Authorization on November 4, 2022. Given a highly dynamic and various approaches regarding Indonesia's efforts in COVID-19 vaccine development, this paper examines the strategies employed by Indonesia in doing so. This discussion is considered crucial as research on Indonesia's vaccine development according to perspective of international relations is still rare.

Using the theories of moderate vaccine nationalism, domestic vaccine development, vaccine science diplomacy, and self-reliance; hypotheses are formulated in this paper. The paper argues that Indonesia has implemented two strategies in developing the COVID-19 vaccine. First, Indonesia conducts moderate vaccine nationalism which encourages the country to start domestic vaccine development. This becomes Indonesia's general approach to develop vaccine during Covid-19 pandemic. Second, Indonesia collaborates with other foreign actors through vaccine science diplomacy as inevitable path to establish new national architecture of vaccine production. It has successfully developed the Indovac vaccine. Third, Indonesia applies self-reliant approach because it is feasible for Indonesia to develop COVID-19 based on its own capacity, which then acknowledged as Inavac.

Theoretical Framework: The IR Perspective on Vaccine Development

The invention of vaccine is inevitably important to ensure human security, particularly in dealing with health issue that comes from infectious diseases. It prevents mortality until 3 million people per year (Ulmer et al., 2006). However, the number of global vaccine production has been rarely met the total number of world population. In assuring the adequacy of vaccine, thus, most states attempt several strategies. There are two ways to do so: first, buying the vaccine from other states or foreign pharmacies that produce it or known as vaccine procurement, and second, by developing vaccine needed which relies on domestic capacity (Gianfredi et al., 2021; Signé, 2021). The first strategy is the most opted and practical response taken by almost every state in the world during health crisis, although they must pay very expensive price for it.

Strategies for vaccine procurement are vary, either buying the whole product from other foreign actors or applying “the fill and finish approach” where local producers buy the vaccine abroad and fill it into doses and distribute them to public. Second, by developing the vaccine which involves state’s science and technological capacities and nationally manufacturing the product. It refers to efforts producing vaccines independently or self-reliance, although during the implementation process in developing country is usually invoking support from other foreign actors, delivered through vaccine science diplomacy.

Compared to procurement, vaccine development is more challenging and difficult as it relies on latest scientific approach of biotechnology. Vaccine development is creating a genetically immune and antibody systems. It takes a new antigen or immunogen using advanced biotechnology and processed the substance into a final form of vaccine. The potential vaccine must pass preclinical and clinical studies to determine its safety and efficacy to combat an infectious disease (Levine et al., 2002). In some cases, vaccine development usually leads to domestic vaccine manufacture when all technical requirements are fulfilled (Gomez et al., 2013).

To some extent, efforts to conduct vaccine development indeed represent the notion of vaccine nationalism. It portrays government’s unilateral efforts to reserve millions of doses of new vaccines for domestic use during a global public health crisis, rather than considering other states. Applying vaccine nationalism signifies indifference to others and highlights the strong profile of political realism as states tend to have total absence of solidarity and humanitarian concern for the world (Zhou, 2022). It has become a common response among states during the COVID-19 pandemic, especially countries with high incomes which work very hard to guarantee their adequate vaccine supply through agreements and negotiations, including with global pharmaceutical industries. Vaccine nationalism hinders coordination among states to equally distribute and to assure the availability of global vaccines. Zhou (2022) portrays vaccine nationalism as the nationalist turn which undercuts multilateral and collective approaches to global problems. World Health Organization (WHO) as a multilateral health organization has been strongly against vaccine nationalism since it leads to further virus transmission and creating new variants of disease (Vanderslott et al., 2021).

Most developed countries, however, are the actors that conduct vaccine nationalism. They have the capacity as well as ability to do so. If they succeed to develop a new vaccine, then they will commit into another “vaccine race”, where they take priority rights to monopolize the production of the limited vaccine doses worldwide (Zhou, 2022). On contrast, low and middle-income countries usually have the shortage in vaccine resources. They are literally left behind in acquiring adequate vaccine supplies. This long-standing disparities in public health sector between higher and lower-income countries creates global disorder. When vaccine nationalism is still consistently practiced by high-income countries, lower-income countries are even struggling with more severe health problem due to several infectious diseases have mutated into the new type of illness.

In practice, the interpretation of vaccine nationalism among governments might be vary from one to another. Each of them will response differently according to their consideration in pursuing their goal (Gruscynski & Wu, 2021; Kampark & Kurečić 2022). Therefore, vaccine nationalism has very complex manifestation and forms (Kampark & Kurečić 2022), for instance from vaccine procurement to development. The interesting point is that these several different vaccine policies can show the level of state’s vaccine nationalism. Following Gruscynski and Wu (2021) and Kampark and Kurečić (2022), there are two levels of vaccine nationalism, strong and moderate.

The former can be represented in the form of vaccine procurement as well as development; yet it refers to the origin form of vaccine nationalism where realist perspective dominates the way a state conducts its vaccine policy. The absence of international cooperation, and very tight competition to be the first actor securing vaccine supplies as well as develop it are the main pattern of strong vaccine nationalism. Countries with strong vaccine nationalism prefer to collaborate only with gigantic global pharmaceutical industries and openly declare that they will prioritize domestic needs while restricting vaccine distribution to foreign countries. As a result, it triggers tensions among countries, especially developed ones. Meanwhile, the later or the moderate level also still focuses on state’s adequate number of vaccines—even for its domestic needs, yet it gives a space for

equitable and fair access to vaccine for all people, by embracing the idea that “no one is safe until everyone is safe” (Kampark & Kurečić, 2022). The notion relatively allows multilateral cooperation, humanitarian concern to be more highlighted, rather than on transactional approach. Moderate vaccine nationalism still prioritizes domestic needs, but it does not openly declare a blockade of vaccine supplies to other countries. As a result, this moderate type does not adopt a provocative stance that could lead to tensions regarding vaccine distribution with other nations. They might even express cooperative statements, indicating their willingness to share their vaccines with developing countries, for instance through South-South cooperation and arrangement. Although not considered as a fixed model, the strong level is likely adopted by high income countries, and the moderate level is by emerging and medium income countries.

If strong vaccine nationalism has two highlights both procurement and vaccine development; for moderate vaccine nationalism merely tends to be more concentrating on vaccine development. It allows a country to provide others when they can produce the vaccine themselves and achieve self-sufficient status. Although vaccine development is very costly and risky, as Milstein (2009) considers that vaccine development in developing countries has to deal with three basic problems, consisting: (1) limited access of emerging suppliers to research results that lead to new vaccine constructs; (2) barriers to vaccine technology development relating to blocking intellectual property; (3) inability to spread the investments which highlights the requirement of a large enough financial base, yet moderate vaccine nationalism opens the opportunity to vaccine equal distribution worldwide. There are a lot of challenges to develop vaccine in these countries, but it does not mean that there is no opportunity for them to develop (Kampark & Kurečić, 2022; Zhang et al., 2023).

Therefore, vaccine development has been highly promoted in developing countries during the last three decades. This strategy helps LMICs to escape from vaccine shortage during health crisis. It is very potential and becomes global current strategy in creating new innovative architecture in international health system. According to Kampark and Kurečić (2022), several middle-power countries have successfully developed vaccines. In details, there are two strategies in pursuing vaccine development in LMICs, vaccine science diplomacy (Hotez, 2014) and self-reliance (Heugas et al., 2024; Zhang et al., 2023).

Vaccine science diplomacy (VSD) is actually a part of vaccine diplomacy (VD). VD refers to the global health diplomacy branch that relies on using or distributing vaccines and collaboration work in worldwide. This critical work has involved bilateral and multilateral agreements, including several global institutions such as the Global Alliance for Vaccines and Immunization (GAVI) alliance, World Health Organization (WHO), and the Gates Foundation. As one feature of global health diplomacy, VD represents to a framework of collective health governance which employs communication and negotiation strategies among states and other global actors in assuring the adequacy of vaccine for their population. Since the imbalance provision of vaccine that mostly produced and secured by developed countries and leaves LMICs in minor position during health crisis; VD attempts to fill the gaps by bridging all states to overcome the problem, establishing cooperation and strengthening diplomatic ties among them (Varshney & Prasanna, 2021; Hotez, 2014; Bhattacharya et al., 2021). Actors involved within VD mostly consist of official diplomats who represent their country to conduct cooperation. As a global practice, VD has been widely developed into VSD. It plays crucial role by not only covering activities that involve diplomats; rather, it strongly promotes collaboration among countries by involving experts and scientists in different areas and disciplines, especially in health, science, and technology, in solving global health problems. VSD invokes international alliance which assembles public and private organizations to work towards a common objective to manufacture and supply high-quality vaccines at affordable prices worldwide (Pagliusi et al., 2013). These scientists and scholars establish strategic network that becomes voluntary public health-driven alliance in both developed and LMICs; and subsequently generates manufacturers in developing countries where most facilities and assets owned by stakeholders in LMICs. This finally opens more opportunities for novel collaborations and partnerships for further vaccine research and development between industrialized and LMICs (Grenham & Villafana, 2018).

The ideas of both VD and VSD above follow the notion of science diplomacy addressed by Royal Society of London (in Gluckman et al., 2017). According to Royal Society, science diplomacy has been classified as: science in diplomacy, diplomacy for science, and science for diplomacy. First, science in diplomacy refers to science as a tool to provide advice, information, and support for foreign policy objectives; second, diplomacy for science is conducted when diplomacy facilitates international scientific cooperation; and third, science for diplomacy is shown when scientific cooperation improves international relations, including in overcoming global crisis.

To some extent, effort to establish international collaboration in vaccine development represents the role of science for diplomacy. It is a forum where scientists become the main actors in collaborative work for the sake of science, with less focusing on a particular political interest. They expand their role not only as inventor of things; rather, they are considered as initiator of global peace and justice, by using their scientific expertise. Hotez (2014) argues that the main issue in VSD is to ensure universal and equitable access to vaccines for combating diseases and pandemic, especially for LMICs. Hotez (2014) elaborates that VSD involves scientists from two or more states as the significant actors to develop and test highly innovative vaccines, by combining approaches from global health and science diplomacy. Since VSD requires a joint effort of scientists from various countries, it can transform countries that have different ideologies or even engaged in an active conflict, into strategic collaboration in science and technology to produce vaccine (Bhattacharya et al., 2021). These circumstances emerge due to the activity requiring heavy scientific input, cross-national cooperation, and compromise on issues between countries involved. Increasing vaccine collaboration and partnership among countries, governments, and non-governmental organizations likely lead to the rapid development of VD and VSD within the framework of foreign policy and the improvement quality of global health management (Varshney & Prasanna, 2021).

In practice, VSD can be accomplished through several strategies: first, by conducting preliminary collaborative activities in vaccine development which is able to foster bilateral and multilateral cooperation. It includes organizing collaborative conference among potential actors. This events likely affect to the further arrangement of several health-related treaties, conventions, and agreements (Hotez, 2014). Second, by sharing the method of preparation as well as administration for a particular vaccine development among countries. This was shown by British scientist, Edward Jenner, who developed smallpox vaccine. He shared his vaccine formula with other countries, such as Russia, Spain, Türkiye, Canada, Mexico, and even some American tribes (Bhattacharya et al., 2021). Third, by sharing the resources that are needed to develop and produce vaccine. This concept was introduced during the establishment of a quarantine in Dubrovnik on the Croatian Adriatic Coast in the 14th century, where it also marked the beginning of VD and VSD (Hotez, 2014). Creating a specific vaccine research institution in developing countries which is assisted by developed countries also exemplifies the case (Hotez, 2014; Bhattacharya et al., 2021). Likewise, Derby-Watson et al. (2018) argues that the VSD requires capacity-building interventions from developed countries, which can facilitate variety of technical supports, such as in-depth consultations, web-based and in-person training, online learning options, guidance materials in the form of knowledge products, and skills-based courses through coaching and mentoring.

Besides VSD, the strategy of self-reliance is also inevitable to build LMICs' architecture in the context of vaccine equity. According to Seung-il Shin (in Blume & Baylac-Paouly, 2022), the domestic establishment of vaccine enterprises in developing countries is crucial. It comprises of development, clinical testing, production, license, and distribution of vaccine. These can be fulfilled when a country has sufficient standard of scientific and technological requirements. Consequently, it allows domestic ability to build a manufacture to produce vaccine which is "publicly owned and publicly spirited" (Blume & Baylac-Paouly, 2022).

Heugas et al. (2024) also continues that vaccine manufacture in LMICs needs to be consistently improved beyond considering vaccines as a finished product. Some requirements must be strengthened to pursue the objective, for instance in the aspects of diagnostics, pharmaceuticals, and education, to foster vaccine self-reliance. These include all the fields of vaccine development, for instance pharmaceutical ecosystem, research and development sectors, market, and political environment. To implement the goal, several scholars (Blume & Baylac-Paouly, 2022; Surianta &

Patunru, 2024; Zhang et al., 2023) believe that it must involve multi-stakeholders, ranging from government to private pharmaceutical industries. This is very important because the engagement of multistakeholder can expand the financial strength of domestic vaccine manufacture. Partnership among government, universities, and industries likely is the answer of the power of vaccine self-reliance, which is known as triple helix approach (Cravalho et al., 2013, Anonymous interview, 8/8/2023). This partnership model is even stronger when it can be brought into international level as it alleviates critical vaccine industrial barriers in LMICs, so that efforts to produce vaccines are more sustainable (Hayman et al., 2022).

Indonesia's Trajectory in Developing COVID-19 Vaccine: Shifting Into Moderate Vaccine Nationalism

After facing significant impacts of COVID-19 pandemic from March to August 2020, which enforced Indonesia importing abundant vaccines from developed countries; President Widodo has eventually decided to produce national vaccine on September 3, 2020, delivered through Presidential decree. This was considered as the first policy shifting in dealing with COVID-19 vaccine, changing Indonesia's position from vaccine importing country into vaccine development ones.

There were several reasons why Indonesia must develop a COVID-19 vaccine. Firstly, Indonesia has the capacity and potential to undertake such an endeavor. In terms of hardware, Indonesia had been conducting research on vaccines in several universities and research institutes—mostly in Java since the avian influenza outbreak in the early 2000s. Furthermore, Indonesia has founded a pharmaceutical state-owned enterprise in 1890 as the legacy from the Dutch colonialism. It has been in charge for manufacturing healthcare equipment and initiating several vaccine developments. Furthermore, Indonesia has sufficient human resources and infrastructure, including the laboratory of biosafety level 3 (BSL 3) and experts in virology as well as immunology (Anonymous Interview, 8/8/2023).

These capabilities encouraged Indonesia to start innovation in COVID-19 vaccine development. President Widodo launched the “Vaksin Merah Putih” (Red and White Vaccine) consortium which comprising 6 working groups from universities, research institutes, and pharmaceutical industries to pursue the objective. During the launching of his Presidential decree, President Widodo emphasizes that Indonesia is capable for its self-reliance initiatives in developing as well as producing COVID-19 vaccines (Presidential Secretary, 2020).

Secondly, in terms of expenditure, the government's budget for vaccine procurement imported from abroad, has been rapidly increasing. Although some foreign countries have supported Indonesia to fulfill vaccine adequacy in the form of grants; the need of sufficient vaccine still generates significant financial burden for Indonesia, due to its large population. In 2020, approximately USD 45 billion was needed for the procurement of COVID-19 vaccines, including 3 million doses of Sinovac vaccine (1.2 million delivered in 2020, and the remaining 1.8 million delivered in 2021), 100,000 doses of CanSino vaccine, and supporting medical equipment such as syringes, swab alcohol, safety boxes, and other supporting medical equipment (Jakarta Post, 7/12/2020).

Research groups within “Vaksin Merah Putih” project started working after the presidential decree has been launched and the President stipulated target for manufacturing the vaccine by the end of 2021. Another innovation has been made for the project, referring to the integration of universities/research institutes with national pharmaceutical industries, either state-own enterprises or private, in each research group. Since the industries now function as national vaccine manufacturers, this shows that another new national health system architecture has been introduced in Indonesia to deal with the new disease. Involving the role of business actor within the process of vaccine development plays important part. It also signifies that the second policy shifting in developing Covid-19 vaccine has occurred, from the previous single or double helix approach relying on the role of government and state-owned enterprise, into triple helix approach where engages collaboration among three prominent actors in vaccine development, referring to academia, business, and government, known A-B-G approach (Indonesia's Drugs and Food Control Agency, 2022; Anonymous interview, 8/8/2023).

All 6 vaccine research groups began their research development at the similar start. The government granted each of them freedom and rights to determine its own vaccine development strategies and methods. Along the process, there were progresses that have been made by two research groups, shown by the success of PT. Biofarma that later produces Indovac and Universitas Airlangga which later develops Inavac. The former is based on the use of vaccine science diplomacy strategy between PT. Biofarma and BCM Texas, while the latter was merely based on national self-reliance of Universitas Airlangga in collaboration with PT. Biotis, a private pharmaceutical manufacture. During the launching of Indovac on 13 October 2022, Presiden Widodo states that this innovation marks an important milestone on the country's trajectories to vaccine independence, which likely brings national economic benefit since the vaccine contains 80 percent of the ingredients coming from local-sourced (The Diplomat, 14/10/2022).

Indeed, Indonesia's contribution in global vaccine provision is not actually a new issue as it has been already started long before the pandemic. This is not only shown with the existence of PT. Biofarma, but also with its prominent role in shaping the establishment of Developing Countries Vaccine Manufacturing Network (DCVMN), a voluntary alliance of more than 40 vaccine manufactures from 15 developing countries and was established in 2000. DCVMN promotes innovation, research, development, manufacturing, and supply qualified vaccine for most developing countries which usually have difficulties to assure vaccine equity. During the COVID-19 crisis, DCVMN (2021) estimates that pharmaceutical industries from developing countries likely contribute 60 percent of global production of COVID-19 vaccine, where 3 percent is provided by Indonesia.

Indovac's Development and the Use of Vaccine Science Diplomacy.

One of the COVID-19 vaccine development schemes within the Vaksin Merah Putih consortium has been carried out by PT. Biofarma. The position of PT Biofarma itself differs from other major actors involved in the other five schemes. Most actor involved were dominated by research institutes and universities, supported by medium-scale national private pharmaceutical industry. Meanwhile, PT Biofarma is the largest state-owned pharmaceutical company that has long been projected to be national vaccine developer as well producer. Based on the 2020 Presidential decree, PT Biofarma has been given the mandate to produce COVID-19 vaccines. It has been given an authority opening collaboration with other foreign research institutes. In further developments, Biofarma eventually succeeded in establishing a vaccine development with BCM, led by Prof Peter Hotez and Dr. Maria Bottazzi.

In the development process of the Indovac vaccine carried out by PT Biofarma, the role of VSD plays significant part. The VSD's variables occurred during the collaboration between the two institutions as follow: firstly, the involvement of foreign counterpart to develop the vaccine. As the member of consortium as well as state-owned enterprise, PT Biofarma was assigned by the Ministry of State-Owned Enterprises (SOE) in June 2020, to take action and respond towards the COVID-19 pandemic with anticipatory measures (VOA Indonesia, 2020). As an institution that in charge for national vaccine provision, the initial action taken by PT Biofarma was purchasing and securing vaccine supply for all Indonesia's population. This was continuously maintained when developed countries have started to create their own vaccine during the early period of COVID-19 crisis. Developing countries, like Indonesia, still bought the vaccine from all large pharmaceutical industries like Sinovax, AstraZeneca, and Pfizer; and sometimes relied on non-profit multilateral vaccine networks, including GAVI—the Vaccine Alliance and COVID-19 Vaccine global Access (Covax).

Thus, PT. Biofarma's early role in dealing with COVID-19 pandemic was more focusing on strong vaccine nationalism, by assuring vaccine procurement for the domestic needs. This approach also involved the coordination of filling vaccines purchased from various countries and distributing them throughout Indonesia or known as filling and finish method. Using this approach, Indonesia finally had its first vaccination program with Sinovax in December 2020, although Presidential policy has been decreed on September 3, 2020. As a result, Biofarma has imported and distributed a total of 279,292,296 doses of the vaccine (PUPR, 2021) due to procurement-based vaccine nationalism.

Amid efforts securing vaccine availability through imports from developed countries and multilateral cooperation, PT. Biofarma continued its efforts by initiating to develop its own vaccine formula. In June 2021, Erick Tohir, the Minister of SOE and also the Chairman of the National Committee for Combating COVID-19 and National Economic Recovery (KPCPEN), considered potential collaboration for COVID-19 vaccine development between PT. Biofarma and BCM from the US (GoodStats, 2022). The cooperation was relatively smooth to conduct because there was support given by Indonesian scientist diaspora who works in US university, and he helped connecting BCM with PT. Biofarma (Anonymous interview, 7/11/2023). At that time, BMC—represented by Prof. Hotez and Prof. Botazzi just has completed similar cooperation in creating a non-patent COVID-19 vaccine with India through its private pharmaceutical industry, the Biological E.

The vaccine development process undertaken by Biofarma and BMC utilizes BCM's formulation on COVID-19 vaccine, the so-called Corbevax. This is a recombinant protein vaccine candidate for SARS and MERS viruses that has been researched from 2011. Afterwards, BCM has modified the vaccine into a new formula which is effective against the SARS-CoV-2 virus, which causes COVID-19 disease.

There are several factors that generate BCM to develop Corbevax relatively fast and has the ability to offers it to developing countries like Indonesia and India. First, the BCM team utilizes technology and method that are very common in vaccine production and considered feasible to be adopted in developing countries. It is recombinant protein-based vaccine, which is made through microbial fermentation in yeast, technology that is common in vaccine production (Texas Tribune 2022). In the context of distribution, Corbevax only requires standard refrigeration, unlike the Pfizer vaccine, which requires ultra-cold storage in transit (The Guardian, 2022).

Secondly, not only relatively affordable in production cost, Corbevax becomes patent-free vaccine that can accessed by LMICs due to the facilitation from the US philanthropy. Corbevax is developed through an open science framework and leading to a shared patent free product where no intellectual property rights attached to it (Washington Post, 2021). BCM indeed provides the vaccine seed as well as consultation to PT. Biofarma during the further process of vaccine development (Anonymous interview, 7/11/2023). With the affordable production cost, Corbevax can be sold to governments of LMICs for far less price than any other vaccine currently available on the market. For instance, the U.S. government pays Pfizer about USD\$20 per dose, meanwhile Corbevax is sold about USD\$2 per dose. Prior, much of the cost for the more expensive vaccine goes to the intellectual property right covered by the patent. The role of philanthropy plays significant contribution to keep the vaccine price affordable. Corbevax in its development at BCM has been supported by Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation, the M.D. Anderson Foundation and the JPB Foundation New York, and Tito company Texas for almost USD\$ 7 million. This support is actually least compared to the facilitation given by US Federal government for the development of Pfizer, Moderna and Johnson & Johnson COVID-19 vaccine which reaches USD\$ 12 billion (Texas Tribune, 2022).

Thirdly, BCM facilitates PT. Biofarma to further develop the vaccine according to the partner's national needs. Different from BCM, PT. Biofarma has applied a different approach in vaccine development, which acquires no animal cells or products within the process. This approach remains important since Indonesia is a muslim majority-country that strongly considers about the halal-ness (allowed according to Islamic law) of a product, including vaccine. Both parties signed a licensing agreement to develop a safe, effective, halal, and affordable recombinant protein COVID-19 vaccine. They also agree that this collaboration would enable the development of an affordable version of the vaccine that could be scaled to 500 million doses for worldwide distribution (ANTARA news, 2022). This further developed vaccine is later known as "Indovax". According to BCM, foreign partners may claim the ownership of the vaccine, produce it, name it and work with the government to bring vaccine access for people (Texas Tribune, 2022). Although developed by BMC, Indovax contains 80 percent of its components that originate from Indonesia (CNN Indonesia, 2022), which strongly positioning the vaccine as a representation of Indonesian products.

Indovax was finally granted Emergency Use Authorization (EUA) after Biofarma has been conducting research for nearly 14 months. It was officially launched by President Widodo on September 28, 2022, allowing it to be used by the public (CNN Indonesia, 2022). Indonesia's approach to develop Indovax

with BCM is almost similar to what India did in August 2020 through the national pharmaceutical company, Biological E. This effort shows that vaccine science diplomacy of Houston-based institute BMC was strongly involved within Indonesia's achievement to develop Indovax. Hotez (Texas Tribune, 2022) has mentioned that Corbevax creates strategic global collaboration, the so-called "Texas Vaccine Diplomacy."

Inavax Development: Self-Reliance and Moderate Vaccine Nationalism

Vaccine nationalism is a basic response of countries when facing pandemic, whether they import vaccines from other countries or successfully produce their own vaccines. This is a form of rational choice for every nation in dealing with a global health crisis, especially when a vaccine has not yet been discovered. As mentioned previously, Indonesia must encounter very high financial burden when it imported COVID-19 vaccine from foreign countries. It encouraged the government to have the initiative to start its own COVID-19 vaccine manufacture by issuing the presidential decree, in order to achieve national vaccine self-sufficiency in the future.

Different from Biofarma and BCM, the other five research groups under the Vaksin Merah Putih consortium are mostly based on national capabilities. This indicates that Indonesia actually emphasizes on self-reliance in producing its COVID-19 vaccine. As a middle power country, Indonesia shares the same spirit to overcome the global COVID-19 crisis through vaccine development. It is actually not a practical preference for Indonesia, given the significant costs involved, the need for adequate expertise and infrastructure, and supportive multi-stakeholders which are relatively difficult; however, Indonesia still opts for the program.

Compared to the progress of developed countries in vaccine production which is to gain maximum economic benefits, Indonesia has different objectives. Indonesia prefers to maintain its moderate profile in developing as well as producing COVID-19 vaccines. Despite the high optimism, Indonesian researchers are well-aware that this project entails uncertainty. Developing vaccine is a very serious matter that requires high commitment from actors involved. Even though some of Indonesian researchers have a track record in efforts to develop vaccine, including for diseases like SARS and avian influenza (Anonymous Interview, 8/8/2023), but it is not always be the case that vaccine development is always heading to success. This becomes strong concern because previously Indonesia has not too experienced in developing and manufacturing vaccine.

However, as the government decided to develop vaccine, so it must supervise the regular progress made by the consortium members. Potential research group that has very significant progress was coming from Universitas Airlangga (Unair) and PT. Biotis, with their final vaccine product, known as Inavac. In developing Inavac, Unair utilizes the inactivated virus platform or isolates the SARS-CoV-2 Asian COVID-19 virus. Most of Inavac's research process was financially supported by the University and Indonesia's Ministry of Health. These supports comprise required infrastructures and series of pre-clinical test. For the infrastructure, Unair improved the quality of its Biosafety Level 3, a rare facility for vaccine development that is located at the Airlangga's Institute of Tropical Disease (ITD). The institute has been equipped with this special facility by the Japanese International Cooperation Agency (JICA) during the previous project in initiating the development of Avian Influenza and SARS vaccines in 2014.

Together with PT Biofarma, Universitas Airlangga become the working groups that made significant progress during the vaccine development. Therefore, the Indonesia's Ministry of Health gave the full support for Unair to complete the task (Anonymous interview, 8/8/2023). Ministry of Health has been convinced by Unair as the University has shown the role to develop vaccine long before the presidential decree has been launched. From the beginning of the pandemic in March 2020, Unair has decided to participate in national vaccine development. It illustrates that Unair has the confidence to start its own vaccine development due to several factors. First, Unair has a specific research institute related to pandemic and disease, the so-called Institute for Tropical Disease (ITD).

Unair's ITD has the prominent role to conduct research on infectious diseases since the outbreak of the avian influenza pandemic in early 2000s'. Later, it has been also appointed as center of excellent research by the Ministry of Research and Technology. During the COVID-19 crisis, ITD was assigned as the coordinating center for tracing, monitoring, and vaccination program. As mentioned before, ITD also has a rare facility, known as BSL-3 laboratory to conduct biotech research, including vaccine. So far, only 3 institutions in Indonesia that have such a facility, including Biofarma, IPB University and BRIN.

Secondly, related to ITD, Unair has also prominent experts who actively engage in vaccine development program. Having education and training program from universities in developed countries, these experts believe that they have the ability to conduct independent vaccine development. Although during the implementation process, they also ask and apply for facilitation from other important domestic actors, such as: Ministry of Health, Ministry of Foreign Affairs, local governments, other state universities, and National Police Department to complete the process, the main capacity still relies on the expertise of its scientists (Anonymous interview, 8/8/2023).

In other words, Unair as the main developer of Inavac has the profile of self-reliance to produce the vaccine. It realizes that COVID-19 vaccine development is a challenging task, but it is also certain that the institution has the internal capacity to initiate as well as implement the project. What is interesting to observe is not about how ambitious Indonesia to develop the vaccine; rather, the ability to produce such a vaccine which can help other developing countries to overcome the pandemic. Being a middle-income country as well as member of Global-South somehow shapes Indonesia's international perspective to less consider on individual economic benefit. Indeed, national interests still become the national priority; but emphasizing on the vaccine equity worldwide becomes most important objective. Even before the vaccine has been produced, the notion to distribute the vaccine to Africa and other LMICS countries through Indonesia's Aid Agency, known as Lembaga Dana Kerjasama Pembangunan Internasional (LDKPI) has been highlighted by Indonesian authorities. Having the experience to be supported by multilateral vaccine framework like Covax, affects Indonesia to do the similar way towards other countries.

Conclusion

The case of Indonesia's COVID-19 vaccine development of Indovac and Inavac, has illustrated that domestic vaccine-development by developing countries is indeed feasible. Since vaccine becomes a global changer to deal with uncertain infectious diseases including for the future, vaccine global equity remains important. Efforts to anticipate the occurrence of similar pandemic in the next coming decades means the establishment of new health infrastructure, like developing vaccine in LMICs that is built on robust and more adaptive technology. At this point moderate vaccine nationalism can lead to the establishment of LMICs' vaccine industry. There are options to conduct moderate vaccine nationalism, either vaccine science diplomacy or self-reliant approach. Indonesia's both strategies in developing the COVID-19 vaccine is indeed feasible to be adopted by other LMICs. The key is clear that the initiatives must be well-supported by domestic stakeholders and also international vaccine alliance, in order to achieve global justice on vaccine equity.

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Interviews

- Anonymous interview, 8/8/2023.
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