Population Growth in Jakarta, Indonesia

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Report Summary:
Population growth threatens Jakarta's resilience as it exacerbates the effects of climate change and impacts the social, environmental, and technological systems in the urban network. This report investigates the problems Jakarta faces due to population growth, potential solution strategies, and ethical considerations. Solution strategies span the mobility, housing, natural resources, and economic spaces. Political and religious aspects of ethical considerations are explored as well as a proposed framework for monitoring the efficacy of solution strategies. Finally, recommendations for further reading and discussion questions are provided.

Keywords:
Population growth; migration; informal settlements; fertility

Case Study: Jakarta, Indonesia
Shock/Stress: Population Growth

1. Problem Statement:

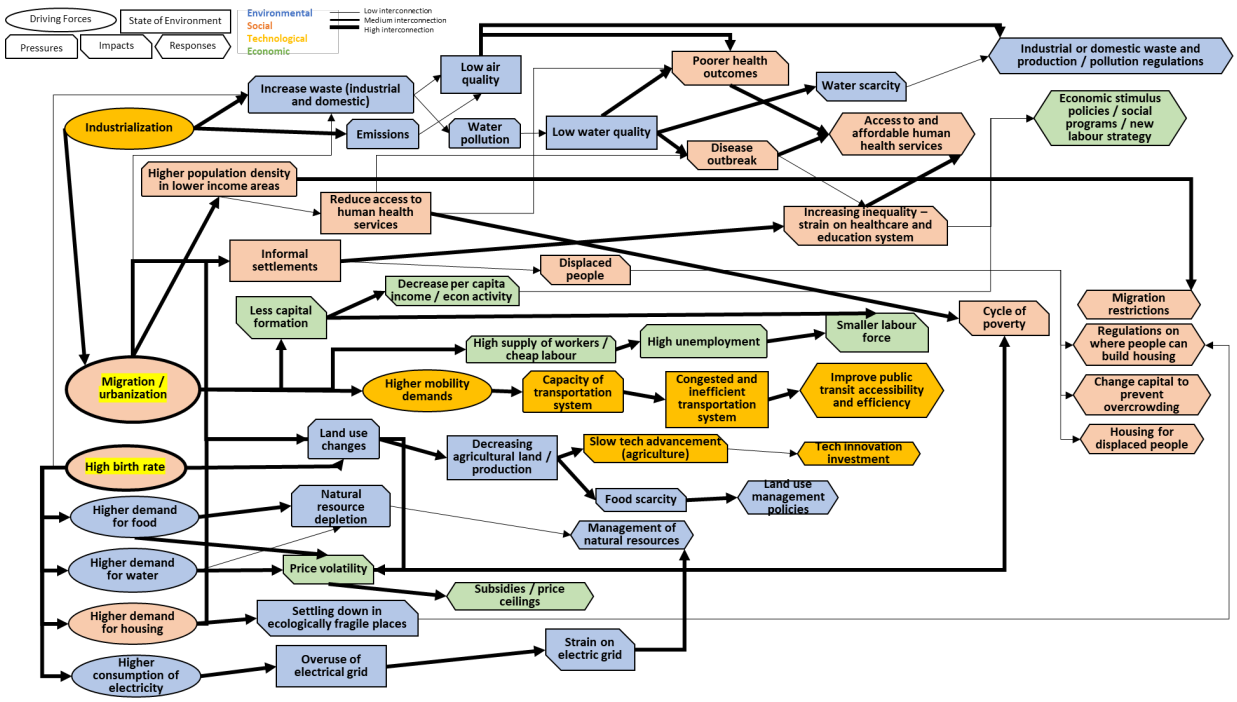


Figure 1. Concept map on the driving forces, pressures, state of the environment, pressures, impacts, and responses of population growth in Jakarta.

Population growth in Jakarta poses a resilience threat as it exacerbates the effects of climate change and requires the city to adapt to rapidly changing conditions socially, technologically, and environmentally. Since around the 1940s, migration has drastically increased the population in Jakarta, transforming it to one of the world's largest urban areas today (Waworoentoe, 2019). According to the World Population Review, Jakarta's population in 2020 is estimated at approximately 10.7 million (Jakarta Population 2020). The

city's population has risen by 1.15% year-over year for the past five years (Jakarta Population 2020). By 2050, the population is projected to be almost 16 million (City population 2050). The rapid rise in population reduces the availability of and access to basic resources, especially for vulnerable groups like the poor. This report explores the impacts of the two main driving forces for population growth—fertility rates and migration—and investigates potential solution strategies and considerations.

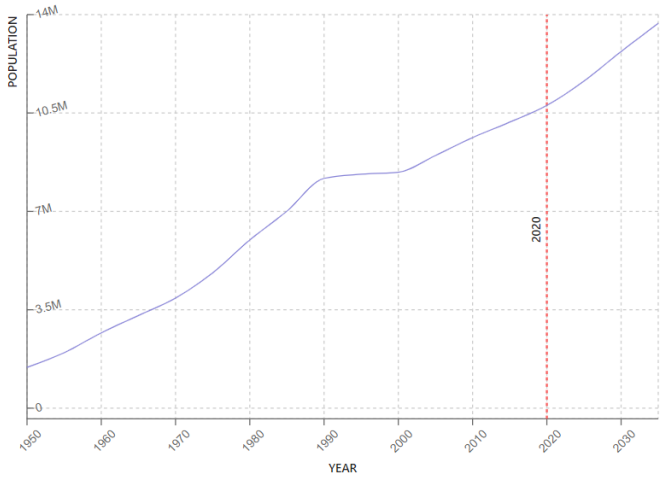
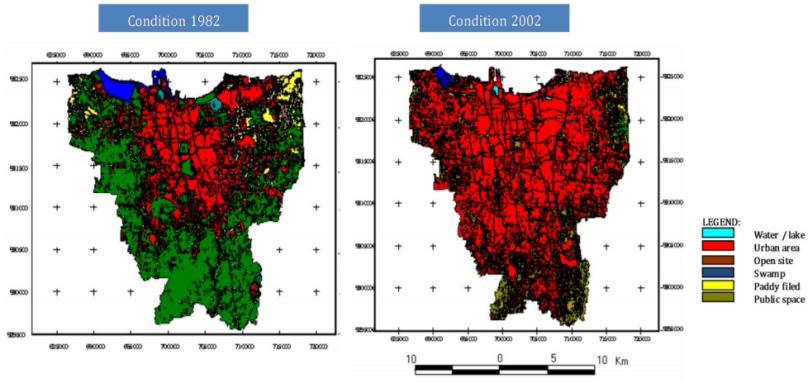


Figure 2. Population in Jakarta over the past 50 years (Jakarta Population 2020).

Industrialization and urbanization have attracted many from rural areas of Indonesia to migrate to Jakarta in search for jobs. Additionally, immigrants from neighbouring countries also come to find employment. In 2019, there were 353 thousand immigrants living in Indonesia (Hirschmann, 2020). Rapid urbanization increases the development of informal settlements known as "kampungs" as there are less options for places to settle down (Alzamil). People are pushed to live in fragile ecological areas like on land below sea level or by riverbeds that are subject to rampant flooding. Around 12.1% of the population, about 3.9 million households, in Indonesia live in urban slums reaching 38,481 hectares (Cities Alliance, 2014).

As shown in Figure 3, urban areas continue to spread. A higher concentration of people in small areas with low-quality housing infrastructure, along with industrialization, leads to increased safety issues, and water and air pollution. The daily average of PM2.5 concentration in Central Jakarta in 2019 was 40.1 mcg/cbm; the World Health Organization's standard is 10mcg/cbm (Aqil, 2020). Higher consumption of food, water, and electricity puts pressure on natural resources and might lead to food and water scarcity. Moreover, the increasing population density exacerbates inequality and causes a strain on the healthcare, education, and public services systems. Indonesia is the sixth country with highest wealth inequality in the world (Oxfam, 2018). Prices soar when demand for a certain commodity increases. When resources run out, it is the poor who first experience a lack of access as they are unable to pay for it. In the future, there may be an increase in 'climate refugees' from areas with unliveable pollution levels and frequent flooding; there may also be more migration due to people unable to receive basic necessities.



Source: Landsat Image (2002).

Figure 3. Distribution of land use in Jakarta (Wismadi et al, 2013).

The public transportation system and electrical power grid will have to be adjusted to increase capacity for mobility challenges and power supply consumption. There are about 3.5 million commuters in Jakarta (Kusumawijaya, 2016). With more people moving around within the city, there will be higher traffic congestion from private vehicle ownership and mobility needs; figure 4 shows the growth of private vehicle ownership in Jakarta from 2001-2011. Increased congestion worsens air pollution since approximately 70% of the city's air pollution comes from vehicles (Cochrane, 2015). Annually, an estimated economic loss of about 4.6 trillion IDR, approximately 3.8 billion EUR, come from traffic congestion (Prayudyanto, 2017). Efforts to reduce fuel use and air pollution levels must continue to ensure an adequate standard of living for the city's residents. Limited mobility may disproportionately impact lower income migrant workers who rely on the transportation system for their day's wages.

Year	Motorcycle	Passenger Cars	Trucks	Buses	Total
2001	1,813,136	1,130,496	347,433	253,648	3,544,713
2002	2,257,194	1,195,871	366,221	254,849	4,074,135
2003	3,316,900	1,529,824	464,748	315,652	5,627,124
2003	3,940,700	1,645,306	488,517	316,396	6,390,919
2005	4,647,435	1,766,801	499,581	316,502	7,230,319
2006	5,310,068	1,835,653	504,727	317,050	7,967,498
2007	5,974,173	1,916,469	518,991	318,332	8,727,965
2008	6,765,723	2,034,943	538,731	308,528	9,647,925
2009	7,518,098	2,116,282	550,924	309,385	10,494,689
2010	8,764,130	2,334,883	565,727	332,779	11,997,519
2011	9,861,451	2,541,351	581,290	363,710	13,347,802

Source: Regional statistics of DKI Jakarta Province (2012).

Figure 4. Growth of private vehicle ownership (Alzamil).

A higher population puts pressure on urban networks, resources, and critical infrastructure. There is more demand for public services and commodities with more people to support. As families grow, agricultural land is converted to industrial and housing areas which decreases agricultural production. The highest rate of agricultural land conversion to urban areas was around 34,600 ha between 1972 and 2001 (Rustiadi et al., 2002). The decline of land availability for farming leads to food scarcity and slows agricultural innovation. With this land use change, agricultural technology cannot take advantage of economies of scale. For

example, on small farms, modern irrigation and agricultural technologies are less likely to be implemented. Converting agricultural lands would decrease the city's food supply and also put farmers out of work, worsening the unemployment rate.

Economically, a shortage of land, food, and water causes price volatility. Unstable prices perpetuate the cycle of poverty for the urban poor in Jakarta because most of their income would have to go to paying for basic needs. As the population grows, there could be less capital formation. The labour force would decrease as there is a larger percentage of dependents in the population who do not contribute to the economy. Both per capita income and economic productivity decrease as a result. Additionally, an increasing migrant population increases supply of workers in the labour market which could potentially lead to increasing unemployment. In the past two years, unemployment increased by 12% to an unemployment rate of 4.69% (Plecher et al., 2020). To be able to sustain the livelihoods of more people, Jakarta must ensure that the economy can support all the population.

Food, water, and agricultural availability decreases per capita as population grows which contribute to increasing inequality and perpetuation of poverty. Indonesia's poverty rate was approximately 9.41% in March 2020 (Harsono, 2019). Inequality leads to a lower standard of living for more of the population; then, competition of basic commodities grows. Typically, the urban poor has less access to healthcare and family planning resources which leads to them having more children who add to the population growth rate. With more children, parents are less likely to have savings, investments, and capital because they have to spend their income on their children. In addition, population growth puts pressure on health, social, education, and public sectors because there is more demand for those services. There is a huge disparity between the number of health service providers and health insurance participants with only about 6,582 participants to one provider (Harsianti, 2017).

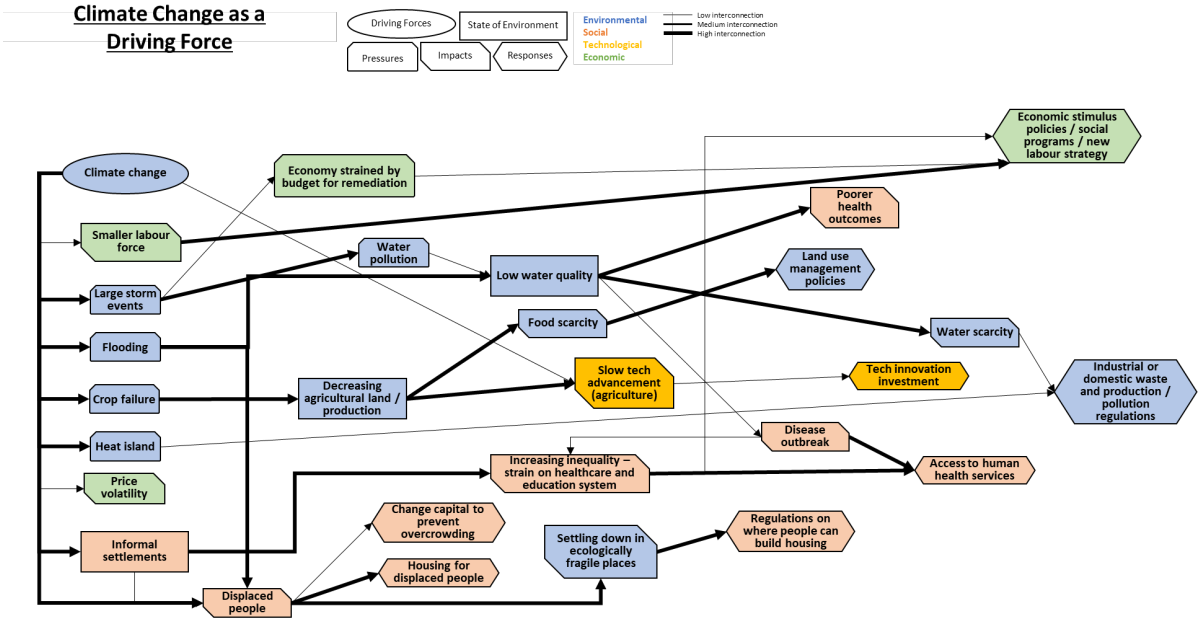


Figure 5. Concept map for climate change as a driving force on resilience challenges.

On top of all the problems that come from population growth, climate change will continue to exacerbate its negative effects until 2050. As climate change creates new record high temperatures and greater rainfall intensity, there will be economic, social, technological, and environmental consequences that impact the population, especially the urban poor (USAID, 2016).[Fout! Verwijzingsbron niet gevonden.] From an environmental perspective, crop yield will be negatively impacted by increasing temperature and rainfall as the current crops would need to adapt to new climate conditions (Alzamil). Crop failure has already occurred on more than 10,000 hectares of agricultural land in West Java due to frequent flooding (Dipa, 2020). Less agricultural production will lead to a decrease in food availability for a growing population. Socially, large storm events can cause waterborne diseases to spread more easily. This poses a threat to the health care system as it would have even less capacity to handle more patients from a disease outbreak. More of the population will continue to be displaced by rising sea levels, flooding, and large storms, making it harder to find proper housing. Technological advancement will continue to slow down. For example, an existing lack of modern farming technology would worsen the effects of climate change since less of the agricultural land can be used for farming. Climate change could also cause further increase in immigration; more migrants might start to move in as a result of changing climate conditions that destroy their prior homes which puts a burden on technological systems like the power grid and transportation. As more resources and infrastructure are damaged by the growing population and frequent disasters, there is a high cost to inhabitants and the city's finances. Economically, climate change would increase the use of budget and resources as more remediation efforts might be necessary after storm surges. Greater Jakarta area floods have caused damages totalling around 5.2 trillion IDR, approximately 300 million EUR (IDN Financials, 2020). This puts a burden on the economy and pressure to direct investment into rebuilding after natural disasters. It could also decrease the available labour force which further hampers economic productivity.

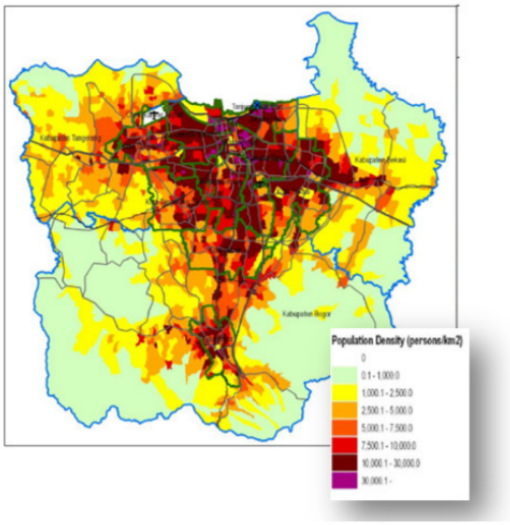
2. Solution Strategies

Technological, environmental, and social policy must be put in place to build Jakarta's resilience against climate change and population growth. To help alleviate overcrowding, the Indonesian government has already announced moving the capital from Jakarta to East Kalimantan, though this might pose additional social and environmental threats that are outside the scope of this report (VOA News, 2020). The following solution strategies should be considered to mitigate the impacts of population growth as a stress on Jakarta.

Migration and mobility

Both immigration and rural-to-urban migration restrictions can be put in place to limit the number of inhabitants in the city. However, restrictions might cause civil backlash and protests as people are moving into the city to find better job opportunities. The government should consider job training programs and develop targeted vocational career paths so that more of the population can find work. As people from different countries and suburbs move into the city, xenophobia or anti-immigrant sentiments due to fear of losing jobs may arise

from the existing population. To make Jakarta more resilient to population growth, the government must also take steps to foster collaboration and equity within the job market via equal opportunity programs. Additionally, to reduce air pollution and congestion in the city, stakeholders in Jakarta must further develop public transportation technology and limit access to the central business district during peak hours (Alzamil). As shown in Figure 6, the population density is highest in the central business district. The government should restrict driving times for private vehicle owners; for example, certain license plates can only drive on the roads from Mondays through Thursdays. In doing so, those in the higher income bracket who can own their own cars can help contribute in lowering congestion and air pollution in Jakarta.



Source: Kusumawijaya (2011).

Figure 6. Population density in Jakarta (Alzamil).

An emerging technology that the government should consider introducing on a large scale is autonomous vehicles. These "self-driving cars" could help Jakarta reduce emissions and air pollution because they have better fuel efficiency by about 15-40% (Howard, 2016). The government can leverage Indonesia's rich natural resources like cobalt and manganese to produce EV batteries domestically and incentivize potential private vehicle owners to purchase electric cars. (Tong, 2020). Autonomous vehicles optimize routes which limits start-and-stop traffic that burns gas quickly. Therefore, with less gas burned, there will be less air pollution. It would also limit traffic congestion by merging traffic flows, making traffic lights almost obsolete (Dezeen, 2016). With better traffic flow, commuters can travel to the city more easily which may open additional work opportunities for many.

Housing and settlements

Regulations on where people can build housing will also help prevent destruction of infrastructure when storms or floods hit ecologically fragile areas. However, this has ethical concerns; as more people begin to be displaced by natural disasters caused by climate change, there are political considerations that have to be factored in on how to handle this displaced population and not 'forcibly evict' them from their homes. The government can consider a housing program for displaced people due to natural disasters that occur in

Jakarta. Progress should be made to improve forecasts and warnings for those living in vulnerable areas. For example, a cloud-based early warning system can be implemented to better alert residents through their cell phones and provide them with forecasts in advance. Emergency response and crisis management should be improved through existing public agencies that can help people who have been evacuated from their homes. Also, consideration should be made to implement more public housing programs so that citizens of every class as well as migrant workers can have a sound place to live, especially near important infrastructure like near public transportation stations. These housing projects could have communal spaces like living room areas and kitchens to save even more space. Additionally, blue-green infrastructure techniques could be integrated so that buildings can be more flood resilient and have better water management. This would require investment cost, ongoing maintenance, and the expertise to execute correctly.

Management of natural resources, waste, and pollution

To help alleviate water and air pollution, there should be regulations on the management of natural resources and waste disposal. Currently, only about 2% of households in Jakarta, about 10 million people, are connected to a public sewage system (Prevost et al., 2020). Efforts should be made to connect more of the population to a sewage system to prevent potential disease outbreaks. Jakarta's main industrial sectors include petroleum, natural gas, mining, rubber, and chemical fertilizers (Asialink Business). The Jakarta Environment Agency discovered that at least 47 companies within the city have failed to meet air quality standards (Aqil, 2019). There must be tighter enforcement of emissions and quality standards like hefty fines if standards are not met. Within the agricultural sector, the government can subsidize farmers to prevent food scarcity to due abrupt land use changes. They should also invest in technology innovation to leverage economies of scale for agriculture and to prevent pollution in industry.

Economic stimulus

A stable economy would be able to sustain more residents of Jakarta and alleviate high unemployment rates. There should be social programs that increase access to public services, education, and job training for all socio-economic levels, including those under the poverty line. For example, during the COVID-19 pandemic, the government offered monthly cash assistance to 2.4 million poor farmers which helped them maintain part of their income (Rahman, 2020). Economic stimulus bills can also help boost economic activity and per capita income, giving opportunities for people to move out of ecologically fragile areas. The government could consider small business loans for those trying to start their own businesses. Currently, more people are employed in the informal sector than the formal sector—57.6% to 40.42% (Hasibuan, 2017). Workers in the informal sector do not have protection of their labour, social, and economic rights. This makes them more vulnerable to the effects of climate change. The government must consider all types of workers including migrants when making policy decisions to better tackle inequality.

Ethical considerations

Ethical considerations for solutions to population growth have social, political, and religious aspects. One way to decrease population growth is by reducing birth rates through family planning programs, but some might lack access to it or have religious beliefs that to not support contraception. From 1976 to 2002, Indonesia halved its fertility rate from 5.6 to 2.6 children per woman (Putjuk, 2014). However, there has been little progress in further decreasing birth rates (McCarthy, 2003). This is due to the decentralization of governance from the national to district level (McCarthy, 2003). In 2012, the government made plans to revitalize the family planning program by providing family planning services free of charge, investing in health worker training, and improving family planning clinics; the goal is to reach a fertility rate of 2.1 children by 2025 (McCarthy, 2003).

Family planning also has socio-economic ethics considerations because typically, it is the poor who lack access to health care and have higher birth rates than the rich. Ironically, it is their lack of financial resources that keeps them poor and therefore more vulnerable to climate change impacts. Efforts have been made to promote the family planning program within Muslim organizations by reaching women in their homes and communities (McCarthy, 2003). Including educational information in prayer groups and Koran readings will help educate more women on their reproductive health (McCarthy, 2003). Developing a strong network within the Muslim women's groups would help reach more mothers and help with monitoring of this solution strategy. Additionally, the younger population has to be educated on family planning resources. There may be other factors that impact birth rates that are beyond a woman's control such as domestic and sexual violence. Ethical considerations related to the reproductive rights and quality of service for all women and girls must be taken into account (Emilia, 2019). The UN estimated in 2011 that about 900,000 teenagers gave birth annually; the World Health Organization estimated about three million unsafe abortions occur annually among girls between 15-19 (UNFPA, 2013). Access to adequate reproductive health care for these teenagers and girls is crucial to the overall family planning strategy.

To monitor the efficacy of solution strategies, a framework for evaluating progress against goals should be established with a clear governance structure. Across social, environment, economic, and technological dimensions, key indicators of success should be identified on a city-wide level. A scorecard should be determined that outline clear objectives and quantifiable criteria that need to be met. Then, specific data collection methods and a timeline should be established. A clear structure for roles and responsibilities of different government, private sector, and civil society organizations should be set up. All stakeholder groups including large companies, social services providers, advocacy groups, and government should collaborate on collecting and reporting data from their progress in a standardized template. Finally, those groups must develop a sound execution plan, involving key actors throughout the process where necessary.

3. Links for Further Reading

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    - This paper was written by graduate level students from the University of Cincinnati, USA in 2019. In their study, they explore the issues Jakarta faces as a result of urbanization. They also offer a plan to help tackle those issues from an environmental, technological, and social perspectives.
2. Sustikarini, A., & Kabinawa, L. (2018). Urban and global populism: An analysis of Jakarta as Resilient City. Retrieved September 23, 2020, from https://iopscience.iop.org/article/10.1088/1755-1315/126/1/012059/pdf
    - This paper is relevant to the discussion on population growth in Jakarta because it expands upon how this stress impacts the social, political, and economical environment of Jakarta. With growing populism and identity politics, more migration into the city worsens the "urban hazards" that already exist. It discusses the ethics behind the issue, highlighting the economic and racial inequalities that were discussed in this report.
3. The World Bank. (2009, December). Urban Challenges in a Changing Climate. Retrieved September 23, 2020, from http://documents1.worldbank.org/curated/en/132781468039870805/pdf/650180WP0Box360ange0Jakarta0English.pdf
    - This report by the World Bank details the impacts of sustained population growth on Jakarta's increasing urban area. It summarizes how land use changes, infrastructure damages, and climate change impacts have been challenging for Jakarta and how those factors have affected its resilience.

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5. Understanding Questions

1. What are the two main driving forces for population growth in Jakarta?
2. What are the four main buckets of solution strategies?
3. How does agricultural land use changes negatively impact technological advancement?
4. Name two ways in which climate change worsen the impacts of population growth.
5. Describe the ethical concern related to family planning programs.

6. Discussion Questions

1. Which solution strategies do you think should be prioritized over others? Explain your reasoning.
2. Discuss what means Jakarta has to implement solutions. Are there other potential actors that they could rely on for help?
3. Discuss how a solution strategy could introduce future vulnerabilities. What are the impacted groups and how will they be impacted differently? Will there be additional inequalities?