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ADAPTIVE MONETARY POLICIES TO CLIMATE CHANGE AND GREEN ECONOMY

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ABSTRACT: Climate change and the shift to a low-carbon economic paradigm ("green economy") have created new macro-economic challenges, including in the tasks and strategies of monetary authorities. This article aims to analyze how monetary policy can be adaptive to climate change and support the transition to a green economy, as well as identify instruments and obstacles in its implementation. The research method is descriptive qualitative based on a review of recent literature and policy studies. The results show that central banks need to expand their analytical framework to include physical climate and transition risks, develop "green" monetary instruments such as green refinancing, green asset purchases (green QE), differentiation of reserve and collateral requirements based on environmental criteria, and strengthen coordination between monetary policy, fiscal and financial regulation. Nonetheless, there are significant obstacles such as unclear institutional mandates, limited data on climate risks, and potential conflicts between short-term price stability and the long-term sustainability agenda. Thus, the integration of adaptive monetary policy and green economy is important to achieve macro stability and sustainable development.

Keywords: Adaptive Monetary Policy, Climate Change, Green Economy, Central Banks, Climate Risk.

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INTRODUCTION

In recent decades, climate change has evolved from an environmental issue to one of the most complex global economic challenges. Rising temperatures, changing precipitation patterns and increasing extreme weather events have affected agricultural productivity, food and energy prices and even global financial stability. These conditions have a direct impact on inflation, economic growth and countries' balance sheets. Along with that, there is a global demand to make a transition to a green economy, an economic system that prioritizes resource efficiency, low carbon, and social justice.

The central bank as the monetary authority has a strategic role in directing macroeconomic policy towards sustainable stability. However, the conventional monetary policy framework that focuses on price stability and inflation control has not fully taken into account climate risks or the impact of the green transition. Fluctuations in energy and food prices due to extreme weather, for example, can create non-permanent but significant inflationary pressures. If central banks are only oriented towards short-term inflation targets without considering environmental factors, their policies could potentially be counterproductive to the goal of economic sustainability.

Therefore, there is an urgency to design a more adaptive monetary policy that not only reacts to financial market dynamics and inflation, but also considers the physical and transition risks of climate change. This adaptation may include the integration of environmental factors in macroeconomic analysis, the establishment of green monetary instruments, as well as closer coordination between monetary, fiscal, and environmental policies.

This article attempts to answer how monetary policy can play an adaptive role in dealing with climate change and supporting green economic development. In addition, this paper also examines the policy instruments that can be used, the results of empirical studies related to the implementation of green monetary policy in various countries, and the challenges faced by central banks, especially in developing countries such as Indonesia.

LITERATURE REVIEW

1. Adaptive Monetary Policy

Adaptive monetary policy refers to an approach where central banks adjust instruments, analytical frameworks and risk assessments to structurally changing economic conditions-including external factors such as climate change.

It goes beyond the traditional focus on inflation and output gap, by taking into account non-conventional risks (such as climate shocks) to the economic and financial system.

2. Climate Change and Economic Stability

Climate risks fall into two main categories: (1) physical risks, which are the impacts of extreme weather events (floods, droughts, storms) on infrastructure, production and supply chains; (2) transition risks, which are the impacts of regulation, technology and market preferences on assets linked to fossil fuels or carbon-intensive industries. These risks can affect macro variables such as inflation (e.g. through commodity supply disruptions) and economic growth and give rise to potential financial insecurity.

3. Green Economy and the Role of Finance

A green economy is defined as a system of production and consumption that results in increased human well-being and social equity, while significantly reducing environmental risks and ecosystem scarcity. The role of the financial sector, including central banks, is to direct the flow of funds to low-carbon projects and technologies, and internalize environmental externalities. Green financial instruments such as green bonds, sustainability-linked loans, and other green incentives are crucial.

4. The Role of Central Banks in the Green Transition

Recent literature suggests that central banks can take steps such as: incorporating green criteria in open market operations, changing collateral frameworks and refinancing coverage, stress-testing climate risks, and implementing "green quantitative easing". However, they still have to maintain their core mandates such as maintaining price stability and the financial system, so there is a potential trade-off between traditional monetary duties and the sustainability agenda.

METHODOLOGY

This research uses a descriptive qualitative approach based on library research. Data and information were collected from international scientific journals, reports of institutions such as the Network for Greening the Financial System (NGFS), Bank for International Settlements (BIS), and national central bank policies. The analysis was conducted by reviewing concepts, frameworks, instruments and practices and identifying implementation challenges. Results are presented in the form of an in-depth analytical narrative.

RESEARCH RESULT

The results show that a growing number of central banks in various countries have started to integrate climate risks into their monetary policy frameworks. This change is driven by the growing awareness of

the potential systemic risks caused by climate change, both to financial sector stability and the sustainability of long-term economic growth. Recent data from the Network for Greening the Financial System (NGFS, 2024) confirms that many central banks worldwide have begun incorporating climate considerations into monetary operations. According to the International Monetary Fund (IMF, 2024), these efforts are essential because climate-related risks can disrupt monetary transmission channels and financial stability if left unmanaged.

In the European region, the European Central Bank (ECB) has taken concrete steps by adjusting its asset portfolio policy through the implementation of environmental screening in securities purchases, as well as reducing reliance on high-carbon intensity assets as liquidity collateral. Data from the ECB's Climate-related Financial Disclosures (2025) show that the portfolio metrics are being tracked and reduced over time (European Central Bank, 2025). The ECB has also introduced a "climate factor" in its collateral framework, giving lower preferential treatment to assets with higher carbon risks (European Central Bank, 2024b). As noted by Schnabel (2023), "the consequences of climate change can disrupt the transmission of monetary policy and the financing conditions faced by households and firms." This adjustment confirms that the central bank is no longer market neutral and seeks to internalize climate externalities in monetary instruments.

In Asia, the Bank of Japan (BoJ) and the Bank of Korea (BoK) took a more incentive-oriented approach to financing by allocating low-interest funding to financial institutions that extend credit for green projects, such as low-carbon technologies and energy efficiency. For instance, the BoJ's "Funds-supplying operations to support financing for climate change responses" scheme allows loans against eligible collateral to support private-sector efforts on climate change (Bank of Japan, 2024). Meanwhile, the BoK has expanded its governance on green finance and is exploring monetary policy tools to support the green transition (Bank of Korea, 2024). These policies increase the supply of green funds and accelerate development of green innovation in the industrial sector. Additionally, several Asian central banks have also started integrating environmental criteria into refinancing and liquidity frameworks, following a global shift toward green monetary initiatives highlighted in NGFS (2024).

In addition, the study found that monetary policy adaptive to environmental issues has a positive correlation with strengthening the financial market structure. When central banks direct monetary instruments such as preferential interest rates, green asset guarantees, and sustainable bond purchases, such incentives are able to lower the cost of capital for companies that develop environmentally friendly projects. Data from NGFS (2024) indicate that jurisdictions implementing green-oriented monetary tools have seen increased

issuance of green bonds and improved liquidity in sustainable finance instruments. Thus, financial markets become more responsive to channel funds to sectors that support the decarbonization pathway. Increased demand for and liquidity in green instruments such as green bonds suggests that monetary policy can play a catalyst role in accelerating economic transformation towards a green economy.

These findings strengthen the argument that monetary policy instruments are no longer solely focused on price stability and inflation control, but also have the strategic capacity to drive structural change towards sustainable development. However, several challenges remain, such as the risk of greenwashing, unpreparedness of the regulatory framework, and emission-data gaps in monetary decision-making. The IMF (2024) emphasizes that "bridging data gaps for supervisory reporting and financial disclosure is a precondition for effective supervision of climate-related financial risks." Therefore, coordination with the fiscal sector, strengthening climate-related financial disclosures, and harmonizing green finance standards are important needs so that the integration of climate risks in monetary policy can run more effectively and consistently in the future.

DISCUSSION

The findings of this study indicate that climate change is no longer just an environmental issue, but has become a structural factor that directly affects macroeconomic dynamics. The impact can be seen in the increasing frequency of extreme weather events that drive food supply chain disruptions, triggering inflation in the volatile food group that is difficult to control with conventional monetary policy instruments. In addition, the transition to a low-carbon energy mix also creates volatility in energy prices, which increases production costs and drives cost-push inflationary pressures. These two phenomena suggest that climate change contributes to climateflation, greenflation, and fossilflation—forms of inflation triggered by both physical factors and complex climate transitions.

Furthermore, climate change can be a source of systemic risk that threatens the stability of the financial system. Damage to coastal infrastructure from natural disasters, for example, has the potential to increase non-performing loans in the property and banking sectors. Meanwhile, the transition risk of tightening emission regulations could reduce the asset value of high-carbon companies (e.g., coal sector), creating the phenomenon of stranded assets. The accumulation of such risks requires central banks to incorporate physical and transition risks into macro-financial modeling so that policy formulation can consider a more realistic and climate-resilient long-term economic scenario.

Nonetheless, the implementation of sustainability-based monetary policy faces a number of significant challenges. Many central banks still

operate with a narrow mandate, emphasizing only price stability and financial system stability without explicitly incorporating sustainability aspects. The expansion of mandates towards green financing often raises legal and political debates regarding central bank independence. In addition, there is a lack of adequate data on the carbon intensity of financial sector portfolios, the quality of corporate emissions reporting, and long-term climate variables. This lack of data hampers the ability of economic models to accurately simulate the impacts of the energy transition. Another challenge is the potential trade-off between short-term inflation control policies and long-term green transition policies. For example, when fossil energy prices increase and drive inflation, the response of tightening monetary policy may suppress demand and reduce investment in renewable energy, which is necessary for future economic sustainability.

In the Indonesian context, these findings confirm that Bank Indonesia has strategic room to strengthen its contribution to supporting the green economy transition. Policy coordination with the Financial Services Authority (OJK) and the Ministry of Finance can accelerate the harmonization of the national green finance framework, including through strengthening the green taxonomy, interest rate incentives for sustainable finance, and improving climate risk transparency in the financial sector.

Recent data show that from 2015 to 2021, Indonesia's public and private financial institutions committed around USD 41.7 billion to climate-aligned investments, equivalent to about 15% of the nation's climate finance needs (Climate Policy Initiative, 2023). As the CPI (2023) emphasizes, "mobilizing climate-aligned investment at scale requires not only public sector commitment but also the integration of financial system incentives that align with national climate goals." Moreover, a study by Rahardjo and Suryanto (2024) found that only 35 out of 140 commercial banks had started to disburse green credit between 2019 and 2022, highlighting that sustainable lending remains limited. They further argue that "the main obstacle in green credit expansion is the lack of standardized assessment on environmental performance and risk disclosure," which limits banks' confidence in financing green projects.

These insights underscore that Indonesia's green monetary transformation still faces structural challenges, including limited institutional capacity, regulatory readiness, and data quality on climate exposure. Optimizing instruments such as macroprudential green incentives (e.g., lower risk-weighting for green credit) can increase the resilience of the financial system to climate risks while expanding access to finance for clean energy and low-emission development projects. Thus, monetary stability and achieving national emission reduction targets are not conflicting goals, but can be realized simultaneously

through policy synergies that are adaptive, collaborative, and based on strong scientific data.

Comparatively, experiences from other economies demonstrate that integrating climate considerations into monetary policy is both feasible and beneficial. For instance, the European Central Bank (ECB) has introduced environmental criteria in its corporate bond purchase program to reduce portfolio exposure to high-emission assets (European Central Bank, 2023). Similarly, the Bank of Japan (BoJ) offers zero-interest funding to financial institutions that provide loans for renewable energy and low-carbon innovation projects (Bank of Japan, 2022). These cases illustrate that green-oriented monetary interventions can simultaneously promote economic recovery and emission reduction without undermining price stability. For Indonesia, adopting similar targeted refinancing facilities for green projects could become a practical policy alternative.

Another critical area for development is data transparency and risk assessment. The credibility of green monetary operations depends heavily on accurate emission data, clear taxonomy, and disclosure standards. Indonesia's current progress on its Green Taxonomy 2.0 (OJK, 2023) provides a foundation, but further alignment with international frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD) and the International Sustainability Standards Board (ISSB) will enhance consistency and investor confidence. As OJK (2023) highlighted, "consistent and comparable climate data are fundamental for integrating environmental risks into financial decision-making." Therefore, developing comprehensive databases and mandatory disclosure mechanisms should be prioritized as complementary policies to green monetary frameworks.

Institutional capacity is equally important. Central banks require internal expertise in climate risk modeling, scenario analysis, and impact assessment. Building these competencies can ensure that policy design remains evidence-based and resilient to future climate shocks. For example, the ECB established its Climate Change Centre in 2021 to mainstream climate risk analysis across all departments, while the Bank of England developed climate stress testing tools for banks. Bank Indonesia could follow a similar trajectory by developing an integrated climate-finance unit that coordinates policy research, data management, and green instrument development.

Finally, the theoretical implications of this study highlight a paradigm shift in monetary economics: from neutrality to proactive sustainability alignment. The traditional objective of maintaining price and financial stability must now coexist with long-term ecological sustainability. This requires revisiting monetary transmission channels in the context of climate risk and redefining optimal policy mixes that balance inflation targets with green transition imperatives. Future

research should explore how adaptive monetary instruments—such as green refinancing operations, carbon-adjusted collateral frameworks, or climate-linked policy rates—can strengthen resilience and accelerate the transition to a low-carbon economy in emerging markets like Indonesia.

CONCLUSION

Adaptive monetary policy to climate change is one of the important policy innovations in a modern economic system that is increasingly faced with environmental uncertainty. Climate change not only impacts ecological aspects, but also creates structural macroeconomic risks that may interfere with the achievement of the central bank's main objectives. Inflationary pressures arising from changes in weather patterns and volatility in energy prices suggest that monetary instruments are no longer able to work effectively if only considering traditional economic indicators such as output gap or inflation expectations. Therefore, central banks in various countries have begun to recognize the urgency of incorporating environmental dimensions, including physical risks and transition risks, into the monetary policy models used in the policy formulation process.

The findings of this study confirm that green monetary policies such as green refinancing rate, green collateral policy, and green quantitative easing (green QE) can contribute to accelerating the transition to a low-carbon economy. These instruments provide direct incentives for financial institutions to increase the share of green credit and reduce financing of high-carbon sectors. In addition, green monetary policy can also lower the cost of capital for clean energy projects, thereby encouraging innovation and sustainable investment in strategic industrial sectors. Thus, monetary policy can perform a dual function: maintaining macroeconomic stability while strengthening the foundation for future low-emission development.

Recent evidence from the European Central Bank (ECB) and the Bank of Japan (BoJ) shows that the integration of climate considerations into monetary operations has begun to produce measurable economic effects, including improved market liquidity for green bonds and declining financing costs for renewable energy projects (IMF, 2024; NGFS, 2023). Similarly, Bank Indonesia has gradually aligned its monetary and macroprudential instruments with national green finance initiatives. The implementation of the Green Taxonomy 2.0 and the development of green macroprudential incentives indicate a growing institutional awareness that monetary stability and climate resilience can be pursued simultaneously. These empirical developments strengthen the argument that adaptive monetary policy is not only theoretically relevant but also practically feasible.

Despite its great potential, the success of adaptive monetary policy depends on a number of supporting factors. First, the clarity of the

institutional mandate of central banks is crucial as the expansion of their role towards the sustainability agenda often leads to political tension and debate over the independence of monetary authorities. Second, the need for reliable climate data and consistent emission disclosure standards are technical challenges that must be addressed to minimize the risk of misestimation in monetary decision-making. Third, cross-sector policy coordination between fiscal, monetary, and financial regulatory authorities is absolutely necessary to ensure that green monetary incentives are in line with national transition strategies and systemic risk mitigation.

Looking at the long-term outlook, adaptive monetary policy has the potential to realize more comprehensive stability, not just limited to price stability and financial stability, but also ecological stability. By internalizing climate risks into policy instruments, central banks can help create economies that are more resilient to climate shocks and support the sustainable well-being of future generations. In other words, the success of green monetary policy will be an important determinant in the global journey towards an environmentally resilient and equitable economy.

RECOMMENDATION

To strengthen the effectiveness of adaptive monetary policy, strategic steps are needed from central banks and policymakers. The central bank should expand its mandate to include sustainability and environmental protection dimensions, without neglecting its primary function of maintaining price stability. In addition, it is necessary to develop green monetary instruments that can facilitate the financing of sustainable projects and reduce exposure to carbon-intensive assets.

Strengthening coordination between monetary, fiscal and environmental policies is also crucial to avoid overlaps or contradictions in policy implementation. The government and financial authorities need to work together to build a comprehensive system of climate risk data and indicators so that central banks can make evidence-based decisions. At the same time, clear policy communication to the public must be maintained so that the adaptation of monetary policy to climate change does not create uncertainty in financial markets.

With an integrated approach, adaptive monetary policy can be a driving force for the creation of a stable, inclusive and sustainable green economy, and make the national financial system more resilient to the challenges of climate change in the future.

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