

令和 4 年 6 月 17 日現在

機関番号：26402

研究種目：研究活動スタート支援

研究期間：2019～2021

課題番号：19K24384

研究課題名（和文）Quantify the burden of mortality from pollution on the environmental sustainability of nations

研究課題名（英文）Quantify the burden of mortality from pollution on the environmental sustainability of nations

研究代表者

ISLAM MOINUL (ISLAM, MOINUL)

高知工科大学・フューチャー・デザイン研究所・講師

研究者番号：60841658

交付決定額（研究期間全体）：（直接経費） 2,200,000円

研究成果の概要（和文）：公害防止は、21世紀の世界の発展のために国連が定めた持続可能な開発目標（SDGs）の多くの達成を促進するものです。公害は、地球の健康を脅かし、生態系を破壊し、地球規模の気候変動と密接に関係しています。発展途上国や後発開発途上国における公害による高い死亡率は、SDGs達成の主な障害となる。本研究では、開発途上国における公害削減政策に焦点を当てます。

研究成果の学術的意義や社会的意義  
この研究結果は、学術雑誌に掲載され、世界中からのアクセスを確保します。本研究は、発展途上国における公害防止政策に焦点を当てたものである。疾病の負担を軽減するための公害防止の重要性は、国際機関（国連、世界銀行）でも注目されています。

研究成果の概要（英文）：Pollution control will advance attainment of many of the sustainable development goals (SDGs), established by the United Nations to guide global development in the 21st century. Pollution endangers planetary health, destroys ecosystems, and intimately linked to global climate change. The pollution induced high mortality in developing and the less developed country will be the main obstacles to archive the SDGs. This research focus on the pollution reduction policies in developing countries.

研究分野：Environmental Policy, Economic Policy

キーワード：Environmental Economics

科研費による研究は、研究者の自覚と責任において実施するものです。そのため、研究の実施や研究成果の公表等については、国の要請等に基づくものではなく、その研究成果に関する見解や責任は、研究者個人に帰属します。

様式 C-19、F-19-1、Z-19 (共通)

### 1. 研究開始当初の背景 (Background at the beginning of research)

How much is the burden of mortality from pollution on nations? Pollution is one of the most significant environmental cause of diseases and there is a substantial impact of mortality from pollutions on sustainable developments. It disproportionately kills the poor and the vulnerable. The majority of pollution-related deaths occur in low-income and middle-income countries.

Despite its substantial effects on human health, the economy, and the environment, pollution ignored, and the health effects of pollution underestimated in calculations of the wealth of nations. Pollution-related diseases cause productivity losses that reduce wealth in low-income to middle-income countries significantly. My research focus is to identify the burden of the pollution by using regional data of countries. At this level, I target the pollution havens; for instance, China, India, where the lion share of the world populations resides and suffering from diseases besides their faster growing economy. I suggest the policy implication after identifying the present, and future burden due to pollution caused mortality. This research project identifies the effect of pollution on the damages of environment. By calculating the total loss of environment, I can summarize the loss of national resources in the regional and country level.

### 2. 研究の目的 (Purpose of research)

This research aims to raise global awareness of the pollution by clearly understanding its impact on the welfare loss of nations. Pollution can no longer be viewed as a separate environmental issue but is a transcendent problem that affects the health and wellbeing of entire societies. Data collected at the national and local levels are essential for measuring pollution levels, identifying and apportioning appropriate responsibility to each pollution source, evaluating the success of interventions, guiding enforcement, informing civil society and the public, and assessing progress toward goals. The incorporation of new technologies, such as satellite imaging and data mining, into pollution monitoring, can increase efficiency, expand the geographic range, and lower costs.

This research aims to understand and control pollution and to drive change in pollution policy. This research explores the importance to link pollution, disease, and environmental policy. I identify and map pollution exposures particularly in low-income and middle-income countries; improve estimates of the financial costs of pollution and pollution-related disease, and quantify the health benefits of interventions against pollution.

This work is to get the present status and future scenarios of pollution-driven human capital loss for China and India, where millions are suffering already. No previous study uses the state level data of China and India to identify the burden of pollution on human capital as well as on the welfare of these countries. This research elucidates the actual burden of polluting in the two fastest growing and highly populated states. To the extent of China and India, by focusing on state-level data, this research pursues policy directions for the green growth of these nations during the research period.

Exposure to pollution increases mortality and shortens life expectancy. In the most severely affected countries, the pollution-related disease is responsible for more than one death in four. In many parts of the world, pollution is getting worse. Therefore, to develop the sustainable growth model of nations, we cannot neglect the pupation related mortality and its damages on human welfare.

### 3. 研究の方法 (Method of research)

I use an inclusive wealth (IW) method and develop a hybrid model that integrates multi-discipline approaches and multi-source data to estimate IW at the 30 arc-second grid level. This study first calculates the natural wealth at the available administrative unit level statistical data. It then calculates the natural wealth at the available administrative unit level with statistical information and then assigns the wealth to grids with geographical data. I use a linear interpolation prediction model to estimate the data onto years without data availability. For secondary time series data analysis,

I use a panel pooled mean group autoregressive distributive lag (PMG-ARDL) model.

#### 4. 研究成果 (Achievements of research)

The importance of pollution control to reduce the burden of diseases take attention of the international organizations (United Nations, World Bank) and commissions (Lancet Commissions). Pollution control will advance attainment of many of the sustainable development goals (SDGs), established by the United Nations to guide global development in the 21st century. Pollution endangers planetary health, destroys ecosystems, and intimately linked to global climate change. The pollution induced high mortality in developing and the less developed country will be the main obstacles to archive the SDGs.

Human life and all human activities depend on nature. Humanity must live within nature's carrying capacity. This research develops a hybrid model and applies it to detect the change in natural capital between 1990 and 2018 in Ladakh, Jammu and Kashmir in this study. By utilizing this framework, it is possible to calculate the natural capital of other regions of the world where the disaggregated data is scared and impossible to gather. In this context, this study opens a new dimension of the valuation of nature's contribution in regionally essential areas of a country. Since 2014, India is the world's fastest-growing major economy. However, India's remarkable growth record has been questioned due to the degrading environment and a growing scarcity of natural resources. India is also suffering from severe regional disparities in development, which may lead to unsustainable inclusive growth. Effective resource allocation policies are imperative to solve these spatial inequality problems. This study opens a new dimension of the valuation of nature's contribution in regionally essential areas of a country.

This research measures the inclusive wealth of the provinces in China from 2000 to 2015 and reports the sustainable use of the resources. Presently, GDP is considered the main economic indicator of a country. Since, GDP is a flow index, reflects the scale of production, economic and industrial structure etc., it fails to capture the total. Missing of wealth accumulation and environmental degradation of a nation or a region. Thus, it damage, which is difficult to determine the capacity of sustainable economic and social development of a nation or a particular region without the total wealth accumulation and environmental degradation factors. The analysis shows that the increase in total wealth in China is significant. However, there still exists unbalanced development across the country. In comparison with developed countries, China is still in a stage of economic development.

Applying the PMG-ARDL approach, this study has estimated the equilibrium (long-run) and short-run relationships among Carbon Dioxide (CO<sub>2</sub>) emissions, trade openness, FDI inflows, real GDP per capita, renewable energy consumption, and primary energy consumption. CO<sub>2</sub> emissions have a negative long-run relationship with trade exclusively for developed countries, while they have a positive long-run relationship with FDI inflows solely for developing countries. The recent trend of increased trade and FDI would promote the transfer of high emission-intensive production units from developed countries to developing countries, causing developed countries to achieve emission reduction at the expense of developing countries.

Information and Communication Technology (ICT) is environmentally favorable for relatively low-income developing countries, while no evident relationship exists for relatively high-income developing countries. To achieve environmental sustainability, ICT policies need to be more emphasized to mitigate environmental problems in least-developed countries. We have applied a panel ARDL analysis with PMG estimators to each of the two income groups during the sample period from 1990 to 2014. Our analysis has revealed that the long-run relationship between CO<sub>2</sub> emissions and ICT differs, depending on a country's development stage.

This research project support to developed following academic articles:

1. Islam, M., & Managi, S. (2022). Valuation of nature's contribution in Ladakh, India: an inclusive wealth method. *Sustainability Science*, 17, 905-918.

2. Jingyu, W., Yuping, B., Yihzong, W., Zhihui, L., Xiangzheng, D., Islam, M., & Managi, S. (2020). Measuring inclusive wealth of China: Advances in sustainable use of resources. *Journal of Environmental Management*, 264, 110328.
3. Essandoh, O. K., Islam, M., & Kakinaka, M. (2020). Linking international trade and foreign direct investment to CO2 emissions: any differences between developed and developing countries?. *Science of the Total Environment*, 712, 136437.
4. N'dri, L. M., Islam, M., & Kakinaka, M. (2021). ICT and environmental sustainability: any differences in developing countries?. *Journal of Cleaner Production*, 297, 126642.

5. 主な発表論文等

〔雑誌論文〕 計4件（うち査読付論文 0件/うち国際共著 1件/うちオープンアクセス 0件）

1. 著者名 Jingyu, W., Yuping B., Yihzong W., Zihui L., Xiangzheng D., Islam M., and Managi S.	4. 巻 264
2. 論文標題 Measuring inclusive wealth of China: Advances in sustainable use of resources	5. 発行年 2020年
3. 雑誌名 Journal of Environmental Management	6. 最初と最後の頁 110328
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.jenvman.2020.110328	査読の有無 無
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 -
1. 著者名 Essandoh, O. K., Islam, M., and Kakinaka, M.	4. 巻 712
2. 論文標題 Linking international trade and foreign direct investment to CO2 emissions: Any differences between developed and developing countries?	5. 発行年 2020年
3. 雑誌名 Science of The Total Environment	6. 最初と最後の頁 136437
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.scitotenv.2019.136437	査読の有無 無
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 -
1. 著者名 N'dri, L., Islam, M., and Kakinaka, M.	4. 巻 297
2. 論文標題 ICT and environmental sustainability: Any differences in developing countries?	5. 発行年 2021年
3. 雑誌名 Journal of Cleaner Production	6. 最初と最後の頁 126642
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.jclepro.2021.126642	査読の有無 無
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 -
1. 著者名 Jingyu Wang, Yuping Bai, Yihzong Wurihan, Zihui Li, Xiangzheng Deng, Islam Moinul, Managi Shunsuke	4. 巻 264
2. 論文標題 Measuring inclusive wealth of China: Advances in sustainable use of resources	5. 発行年 2020年
3. 雑誌名 Journal of Environmental Management	6. 最初と最後の頁 110328 ~ 110328
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.jenvman.2020.110328	査読の有無 無
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

〔学会発表〕 計1件（うち招待講演 1件 / うち国際学会 0件）

1. 発表者名 Moinul Islam
2. 発表標題 Inclusive Wealth
3. 学会等名 Symposium on Inclusive Growth (招待講演)
4. 発表年 2021年

〔図書〕 計0件

〔産業財産権〕

〔その他〕

-

6. 研究組織

氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
---------------------------	-----------------------	----

7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計0件

8. 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関
---------	---------