Lecture # 25 – Environmental Issues in Developing and Emerging Economies

I. Environmental Priorities in Developing Countries

- Much of this class will be discussion based. The notes here summarize my introduction to the topic, and include various discussion questions. I'll post full notes that include notes on the discussion questions after class.
- We begin by thinking about what issues are priorities for citizens of developing and emerging economies?
    - Are there differences from the priorities of those in rich countries?
    - Can we "grown now, clean up later"?
        - Based on the logic of the environmental Kuznets curve
- What motivates changes in environmental policy?
    - Industrial nations observed a key turning point
        - Cuyahoga River fire in US
        - Mercury spill from a plastics factory in Japan killed thousands around the bay of Minamata
- Environmental problems are often, but not always, worse in low and middle-income countries
    - Deaths from air pollution increase with income (Source: Greenstone & Jack, *Journal of Economic Literature* 2015)
    - These trends still hold)
        - A 2018 World Health Organization report found that 90% of air pollution-related deaths occur in low- and middle-income countries
            - Between 2010 & 2016, air quality got worse in 70% of poor cities in south and south-east Asia
- **Question**: Which issues are priorities in developing countries?

II. Growth and the Environment

- Driving forces of environmental problems in developing countries include:
    - Population growth
        - Most are in developing countries.
    - Increasing urbanization
        - As in the developed world, developing countries are seeing a movement from rural areas to cities.
        - Most people move to cities for jobs.
    - Industrialization
        - Developed countries moved from agriculture to industry to services.
            - Industry $\Rightarrow$ more pollution
            - Services $\Rightarrow$ less pollution
    - Changing preferences (e.g. more consumption)

- These trends led to the hypothesis of the environmental Kuznets curve (EKC)
    - Posits an inverted-U shape relationship between per capita income and pollution
    - But different pollutants follow different paths, as the examples from the reading show.
            - CO_2 per capita higher in richer countries
        - Particulate levels in cities better in richer countries than poorer countries
            - Local issues that are highly visible (e.g. air pollution) are typically addressed as countries grow
            - This trend holds for other goods where demand increases as income increases, such as safe water and sanitation facilities. These are clearly normal goods.
        - Ozone shows no clear relationship

- Thus, there is no one answer to whether development helps or hurts the environment

- To assess the impact of growing income and economic development on environmental quality, we start with a theoretical framework. This comes from Greenstone and Jack (*Journal of Economic Literature* 2015), which is referenced in the reading by Jayachandran
    - Their model derives the marginal willingness to pay for environmental quality ($MWTP_E$). Key assumptions:
        - Individuals maximize utility choosing levels of consumption, improvements in environmental quality, and self-protection
        - Assume no other market failures
            - Thus, the model provides first-best outcomes
        - Factors determining $MWTP_E$:
            - Environmental quality affects utility directly (e.g. aesthetic preferences)
            - Environmental quality affects utility indirectly via health
                - Health also affects income
                - E.g. workers exposed to pollution may be less productive
            - Can mitigate health effects by spending on self-protection
                - E.g. air filters, water purifiers
            - Environmental quality affects income, which affects utility via the budget constraint
                - E.g. revenues from tourism depend on environmental quality
            - Consumption may affect environmental quality
                - Directly, by changing environmental quality
                - Indirectly, through consumption and self-protection
        - Key results
            - WTP for environmental quality is the marginal rate of substitution between income and environmental quality.
            - Decreasing marginal utility of income =>
                - low $MWTP_E$
                - spend more on self-protection as consumption goes up
                    - True even if self-protection harms environment (e.g. using more air conditioning)
            - Implications:
                - High marginal utility of consumption
                    - Money goes to consumption first
                    - Implies low environmental quality is efficient
                - As incomes increase, consumption increases, but so do expenditures to protect the environment

- But other factors besides income matter. Jayachandran's paper extends this work, looking at multiple possible links between economic growth and environmental quality. We'll discuss how these affect environmental quality as income increases?

- **Question:** Can we "grown now, clean up later"? Should environmental protection be more of a priority in developing countries?

III. Infrastructure

- Availability of infrastructure is also important. We use electricity as an example.
- Consider, for example, why charcoal is often used as cooking fuel.

- Electricity in Africa
    - Electricity consumption much lower in Africa
        - Average consumption per person per year:
            - sub-Saharan Africa (excluding S. Africa): 185 kwH/year
            - Europe: 6,500 kWh/year
            - United States: 12,700 kWh/year
    - Without electricity, people spend more money to get lower quality energy
        - May pay up to $10 per kWh for fuels such as kerosene or batteries for cooking and lighting
        - Often use charcoal or biomass for cooking
        - When electricity connections are available, they are often lower quality
        - Thus, alternatives to electricity are often dirtier
    - Even diesel generators have higher costs
        - Cost more than electricity from the grid
        - Generate lots of pollution
    - Expansion of both generating capacity and transmission lines are needed
        - June 2022 IEA report: To provide universal access to electricity by 2030, Africa would need to double its total generation capacity
            - Renewables could provide 80%, but not all

- Discussion questions:
    - What are the challenges to continued expansion of the electric grid?
    - Are "minigrids" a good solution?

- Another challenge is integrating renewables into the electric grid
    - Donors prefer renewables, so as to not lock in countries to new fossil fuel plants
        - But renewables are expensive and intermittent
            - Need good baseload power to develop industry
        - Possible baseload sources:
            - geothermal
            - hydro
    - Note that if all new electricity in Africa came from natural gas, global emissions would increase by1%
    - Without donor financing, most fossil fuel projects financed through the private sector
        - Higher prices have made developing projects easier
            - E.g. Europe now wants African natural gas
        - Also turn to China for loans

IV. International Aid

- International aid and climate change
    - The *Economist* articles "Development v climate" and "A day late and a dollar short" discuss the role of international aid. Key issues that come up include:
        - Potential conflicts between aid for poverty reduction and aid for climate change.
        - Tradeoffs between aid for reducing emissions versus climate adaptation.
    - We'll conclude class discussing these tradeoffs.