

Stimulating Innovation for Green Industrialisation

Jeremy Wakeford

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Summary

Many countries in Africa are actively pursuing industrialisation strategies in order to promote inclusive growth. At the same time, the continent is highly vulnerable to climate change and other environmental pressures. This means that African economies need to find ways to leap-frog traditional industrialisation pathways that damage the environmental resource base, and instead adopt more sustainable modes of industrial production. Innovation is a critical driver and enabler of industrialisation and growth, while sustainability-oriented or ‘green’ innovations can play a key role in achieving improvements in resource productivity and reductions in wastes and emissions, including greenhouse gases. Numerous policy interventions can help to stimulate green innovations and ensure healthy innovation ‘ecosystems’, in which networks of actors create and share new knowledge and techniques.

Challenges for the policy-maker

- Industrialisation is necessary for poverty alleviation, job creation and economic development, but historically it has had many damaging impacts on the environment, including water, land and air quality.
- Firms may externalise production costs to the environment and lack the incentives to invest in cleaner technologies.
- Innovation tends to be thwarted by externalities such as its public good characteristics and incomplete information.
- Firms may lack information on greener products and production processes.
- Firms may lack access to credit in order to finance innovation activities and new technologies.
- Importers in some key international markets are setting increasingly stringent environmental standards on products exported from African countries.
- The capacity of governments to formulate, monitor and enforce environmental regulations may be weak.
- Research institutions may not make the knowledge they produce accessible to private sector companies.

Actions for the policy-maker

- Mainstream green innovation policies within industrial development strategies.
- Ensure cross-ministerial coordination of innovation policies with macroeconomic, trade, industrial and competition policies.
- Invest in basic and tertiary education, as well as vocational training, including environmental programmes at all levels.
- Provide incentives for universities to commercialise research findings.
- Strengthen the linkages between the various actors in the national and sectoral innovation systems, e.g. by funding industry development institutes to act as coordinators.
- Foster industrial parks with centralised waste treatment facilities.
- Expand ICT infrastructure to enable firms to access the knowledge economy.
- Introduce tax incentives or grants to stimulate private sector innovation.
- Strengthen intellectual property rights.
- Use economic instruments to price in environmental externalities.
- Introduce sound environmental regulations together with adequate monitoring and enforcement capacity.
- Craft strategies for moving up the global value chain in a “green way”.

Insights from research

Innovation has long been recognised as central to the socio-economic development of countries. According to the World Bank (2010:6), innovation is “the main source of economic growth, it helps improve productivity, it is the foundation of competitiveness, and it improves welfare.”ⁱ Innovation generates positive spill-over effects and is essential for enabling a transition to a knowledge-based economy. Furthermore, sustainability-oriented innovations are widely regarded as essential for the realisation of green economies and green industrialisation.

Innovation means the introduction of new knowledge, technologies and practices, and their diffusion (i.e. dissemination and use) within an economy. A more technical definition is provided by the Organisation for Economic Cooperation and Development’s *Oslo Manual*: “An innovation is the implementation of a new or significantly improved product (good or service), a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.”ⁱⁱ Green innovations bring about environmental improvements such as reductions in resource inputs (such as energy, water and materials) and reductions in solid, liquid and gaseous waste products, including carbon emissions. In a developing country context, innovation is often something that is not new to the world, but is new to the society in question and can deliver significant economic, social, or environmental change.

A critical step for any developing country is to strengthen its national system of innovation (NSI), which refers to the network of institutions in the public and private sectors that are involved in the generation, transfer and application of new knowledge. These include government agencies and regulators, higher education institutes, public research institutions, firms, industry associations, financial organisations, non-governmental organisations, and consumers. In addition to the *national* level, innovation systems may exist on a *regional* basis, in different *sectors*, and for various *technologies*.

The innovation performance of individual firms is influenced by a range of so-called *framework conditions*, which refer to the institutional and economic environment within which firms operate. These include: systems of basic education, universities and technical training; the science and research base; codified knowledge (e.g. publications, patents, technical, environmental and management standards); communications infrastructure (mobile phone connections; landlines; internet connectivity); innovation policies and other government policies that affect firm-level innovation; macroeconomic stability (e.g. GDP growth, inflation, public debt, budget deficit, current account balance, exchange rate); microeconomic and macroeconomic policy settings (e.g. patent law, taxation, openness to trade and foreign direct investment, corporate governance rules, competition policy, environmental laws); financial institutions (determining ease of access to finance); market accessibility (e.g. opportunities for the establishment of linkages with customers, market size and ease of access); and industry structure and the competitive environment. All of these dimensions need to be addressed by policy-makers in order to strengthen innovation systems.

The performance of innovation systems can be assessed according to various *functions* that facilitate different types of interactions among its various components (actors, networks and institutions). These functions include knowledge development and diffusion, entrepreneurial experimentation, market formation, mobilization of resources, and development of positive externalities.

Firm surveys can be used to gather information about the extent (or lack) of innovation activities, the *drivers and inhibitors of innovation*, and the strength or weakness of innovation system networks. The major motivations for innovation at the enterprise level are to improve firm performance and boost competitiveness, either through addressing demand/competition factors (e.g. increasing the range of goods or services on offer, expanding market share, entering new markets), or by targeting production/cost aspects (e.g. increasing production capacity, boosting efficiency and reducing unit costs). Firms may also innovate in order to comply with environmental regulations and to improve health and safety standards. A number of obstacles may inhibit innovation amongst firms. These include cost factors (lack of funds, lack of access to finance and high costs of innovation), market factors (uncertain demand, barriers to entry and competition), knowledge factors (lack of skilled personnel, inadequate information about new technologies, and a dearth of market information) and institutional factors (weak property rights, high costs of doing business as a result of the regulatory environment, and a lack of reliable infrastructure).

Some key principles for green innovation policy have been identified in the literature:

- The approach to innovation policy should be both gradual and systemic.
- Innovation policy needs to be informed by a long-term vision.
- The greening agenda should be mainstreamed in the national system of innovation.
- Heterogeneity across countries and context specificity matters.
- Innovation policies should be as predictable as possible.
- Both supply side and demand side policies are required.
- Innovation policy formulation and implementation should incorporate a learning process.
- The need for building functioning (green) innovations systems needs to be emphasized.

Policies to support green innovation are required because of two main types of market failure: those that inhibit innovation in general (such as the public good characteristics of innovation, and uncertainty and incomplete information), and environmental market failures (externalities) that hinder green innovation specifically. An effective innovation policy needs to address these market failures through economic incentives and regulations, but also give attention to strengthening the framework conditions and functioning of innovation systems. All of this requires capacity-building and the strengthening of relevant institutions, as well as high-level leadership within government.

For further evidence-based research on innovation and other topics, please consult the QG Knowledge Hub: <https://quantumglobalgroup.com/knowledge-hub/research-papers/>

i World Bank. 2010. *Innovation Policy: A Guide for Developing Countries*. Washington, DC: World Bank.

ii OECD/Eurostat. 2005. *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd ed. Paris: OECD Publishing.