Deutsches Institut für Entwicklungspolitik

German Development Institute

PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

GREEN INDUSTRIAL POLICY:

CONCEPT, POLICIES, COUNTRY EXPERIENCES

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

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Humanity is confronted with profound and mounting man-made environmental crises. The United Nation's Millennium Ecosystem Assessment provided an alarming inventory of the degree of deterioration in many of the world's ecosystems (MEA 2005). Global warming is now widely recognized as an immediate threat to humanity. As the Intergovernmental Panel on Climate Change shows, only a few years are left to radically decarbonize the world economy if disastrous global warming is to be avoided (IPCC 2014). Other environmental crises have so far received less public attention, but are also serious and potentially threatening the continuity of human life on Earth. These include the loss of biodiversity, depletion of water reserves, ocean acidification and reduction of soil fertility, among others (Rockström et al. 2009).

Even in purely monetary terms—if we isolate nature's intrinsic value from the equation—the costs of environmentally unsustainable practices are enormous. The Lancet Commission on Pollution and Health estimates welfare losses due to environmental pollution at more than US$ 4.6 trillion per year, or 6.2 per cent of global GDP (Landrigan et al. 2017). The economic cost of global warming has been estimated at more than US$ 1.2 trillion per year, reducing the world's economic output by 1.6 per cent annually (DARA and the Climate Vulnerable Forum 2012). Various other, yet less visible, environmental threats may cause loss and damages in similar orders of magnitude. The dramatic reduction of population of bees and other insects so essential for pollinating crops, and thereby securing global harvests, is just one example.

A key underlying reason of all these negative trends is that the incentives that guide the way people invest, produce and consume are not accounting for environmental costs. Those are 'externalities' in the economic jargon. The need to rethink our incentive systems is thus obvious and urgent. Incentives need to be inspired by the principle of sustainability. They must be designed to ensure that environmental costs are internalized, pollution is kept to a minimum, material consumption is reduced, and inputs are reused or recycled to the greatest possible extent.

At the same time, there are social and economic challenges and aspirations. People want to live decent lives. Poverty is still widespread in many countries, and even in rich nations there are substantial clusters of poverty and unsolved problems of human development. Therefore, we need to tackle a dual challenge: To pursue economic development and wealth creation, particularly solving the problems of deprived segments of societies, while keeping resource consumption and pollution in accordance with Earth's biocapacity. Sharing prosperity more fairly is surely one part of the agenda. The other part, which is at the centre of this report, is to develop institutional and technological solutions that enable us to decouple economic development and human well-being from resource depletion and waste production. The benefits are obvious. Tackling the environmental problems that are causing millions of deaths and profound welfare losses today, and undermining the foundations for the development of future generations, will pay off for all of us.

Developing new institutions and technologies is a challenge for all countries. As the Global Footprint Network has shown, almost all countries that have achieved acceptable levels of human development—scoring 0.8 or higher on the Human Development Indicators, which is UNDP's threshold for high human development—did so by overstepping the world's biocapacity, whereas those countries that stayed within the Earth's limits so far invariably failed to provide the conditions for a high level of human development (Global Footprint Network 2010; UNEP 2011). Put differently, not a single country worldwide provides a role model for achieving decent human development sustainably within Earth's biocapacity. Just to emulate the development pathways of today's rich countries, assuming a linear development trajectory along which countries gradually evolve from underdeveloped to developed, has never been a convincing proposition, given countries' manifold and individual characteristics in terms of history, culture and geography. Once we start using sustainable development as a yardstick, it becomes even more obvious that development is not about 'catching up' with today's rich nations.

From this perspective, economic latecomers to the globalizing world economy even have an advantage. They can build their cities, their manufacturing industries, their energy and transport systems and their institutions in new, more sustainable ways that take their distinctive national characteristics into account. Surely, those countries that industrialized early had more time and better opportunities to accumulate wealth and develop institutions that may now help them cope with

environmental challenges. However, latecomers are not as deeply locked into existing unsustainable infrastructures and century-old institutional routines that often hamper change in many ways.

In this report, we explore policy options for managing structural change that accounts for both the productivity and the environmental challenges in a harmonized way. We use 'green industrial policy' as our key concept. The term 'industrial policy' encompasses sets of measures that governments use to influence a country's economic structure in the pursuit of a desired objective.1 Until very recently, this desired objective was first and foremost to enhance the productivity and competitiveness that in turn would allow for economic growth and higher incomes. However, as we have seen, looming environmental catastrophes—as well as other alarming trends related to poverty, inequity, exclusion and conflict—force us to reconsider the kind of structural change we want. The 2030 Agenda for Sustainable Development, adopted by the UN General Assembly in 2015, reflects a more encompassing perspective on the transformation of societies that balances economic, social and environmental objectives (UN 2015).

Our concept of green industrial policy starts from the assumption that we can learn a lot from several decades of experimenting with policies aimed at shaping economic structures in the pursuit of societal objectives. Many key principles of successful industrial policymaking can be derived, for example: the way entrepreneurial search processes can be channelled towards certain agreed societal objectives; how regulations, market-based instruments and financial incentives can be combined; how public services are delivered most effectively; and how mandatory and voluntary measures can be coordinated to achieve the best result. Applying these lessons to green industrial policy moves toward further specifics. These derive from the need to harmonize the requirements of productivity-enhancing structural change with environmental objectives and to align national interests with the protection of global commons. This has manifold practical implications. For example, certain economic transformations need to be accelerated to achieve results before ecosystems collapse and the original equilibrium cannot be restored. This calls for more proactive policy guidance to phase out harmful technologies and policies and to use both 'carrots and sticks' to speed up the dissemination of sustainable alternatives.

Our report aims to provide guidance to policymakers and practitioners as well as to contribute to the academic debate on green transformation strategies. It provides an up-to-date overview of the debate on green industrial policy, explores what countries can gain economically from pursuing environmental integrity, and what policy options are available to accelerate the transformation in ways that enhance well-being and environmentally sustainability together. Practical examples are included in all chapters, and four national examples of successful green structural change are presented in detail, covering countries at very different levels of income and technological capacity.

The report has four parts. **PART 1** discusses the **conceptual foundations** of green industrial policy. Altenburg and Rodrik explain why looking through the lens of industrial policy provides important insights for a green transformation. They summarize lessons learned from decades of experimentation with, and research on, industrial policy and bring out key principles of smart policymaking that maximize the government's ability to overcome market failures while keeping the inherent risks of misallocation and political capture to a minimum. Subsequently, the authors identify six extra challenges of green transformations and explain the ways green industrial policy must go beyond the common practice of industrial policy in a business-as-usual setting.

PART 2, the economic co-benefits of green transformation, shows that green industrial policy may bring a number of economic co-benefits, in addition to environmental improvements. Padilla argues why, despite existing trade-offs between growth policies and environmental protection, the idea of growing first and cleaning up later is not a good approach for policymakers and discusses what developing countries can gain from a green transformation. He identifies twelve ways in which developing countries can reap social and economic co-benefits of greening their economies. These range from better conditions for human health, preservation of resources for future growth, and avoidance of high switching costs in the future to immediate cost reductions through resource-efficient production and leveraging new competitive advantages through environmental goods and technologies.

1 There is no uniform and generally agreed definition of 'industrial policy'. For an overview see Warwick (2013).

Ambec then focuses on the firm level, describing how developing-country firms can gain competitive advantage through green policies. He shows that, although environmental protection often comes at an additional cost to firms, it can also enhance their competitive advantages along four channels: product differentiation through green labels; development of new green products; productivity improvements that more than compensate for the costs of environmental protection; and knowledge spillovers in the innovation process.

Esposito, Haider, Semmler and Samaan explore how a green transformation can create employment benefits. Green transformation necessarily affects labour markets, creating new jobs in the environmental goods and services sector, but also reducing employment opportunities in sectors that are deliberately phased out due to their polluting effects. Measuring the net effects, however, is difficult because environmental improvements are incrementally adopted across sectors throughout transition and it is therefore impossible to draw a clear line between environmentally sound and polluting sectors and jobs. Also, it is difficult to attribute employment changes exclusively to environmental policies. With all these limitations in mind, there is evidence that what statistical authorities define as the environmental goods and services sector is increasing its employment share in most of the countries for which data exist.

PART 3, accelerating change, discusses some of the key policies that help to implement the green transformation. Given the urgent need to reduce some environmental pressures, proactive policies are needed to accelerate the replacement of unsustainable products and practices with green alternatives. Cosbey, Wooders, Bridle and Casier provide an overview of policy options to phase out environmentally harmful industries. Abandoning such industries is particularly challenging when the level of invested capital is high and there are strong linkages throughout national economies that create vested interests defending the status quo. To manage the transition to clean alternatives it is important to get public buy-in through consultations, combined with well-defined gradual timelines for change and support measures for those who are negatively affected. Societal acceptance is likely to be greater if the phase-out goes hand in hand with measures to develop environmentally sound substitutes.

Never and Kemp show how the phase-in of green alternatives can be accomplished. The challenge here is to cope with a variety of disincentives: the new green alternatives typically need to develop and become competitive in the face of established technologies that benefit from existing network effects and economies of scale, from path-dependent consumer behaviour and from political backing influenced by vested interest groups. Building on experiences from China, Germany, India and the Netherlands, the authors identify seven principles for the design of phase-in policies.

Schlegelmilch, Eichel and Pegels explore the rationale of environmental fiscal reforms and show how they need to be designed, particularly in developing countries, to achieve the dual purpose of protecting the environment and spurring competitiveness, industrial development and jobs. Differential taxation signals environmental costs while leaving it to competitive market forces to find the best technological and organizational solutions. Environmental fiscal reforms enhance the competitiveness of clean industries and reduce competitive advantages of polluting industries. Tax rates for enterprises exposed to international competition thus need to be designed carefully, and more efforts should be undertaken to harmonize environmental taxation internationally. Revenues can be used for poverty reduction, green infrastructure and other national priorities, and they can be channelled in a way that helps to build reform alliances and overcome resistance.

Evans, Rabbiosi, Averous and Balke show what is needed to shift from linear production systems in which a large part of the material inputs of production end up as waste to circular economies that reduce waste, reuse materials as much as possible and recycle the rest. Circularity is thus a key principle to decouple production from resource consumption and pollution. The authors discuss different circular economy approaches and provide an overview of key policy instruments. These range from eco-design guidelines that ensure convenience, longevity, repairability and recyclability and extend to the setup of waste collection systems and the promotion of resource-saving business models, such as sharing platforms. The authors argue that such policies need to be contextualized for different country conditions and they illustrate this with a series of examples including eco-industrial parks and nation-wide systemic solutions.

Cosbey then explores the ways in which green industrial policies might be restricted by international trade and investment law. Many industrial policy tools have trade-related aspects and these are regulated through a range of multi- and bilateral agreements with strong enforcement

mechanisms. For example, tariff policy is strongly constrained by bound tariff rate commitments; subsidies and performance requirements conditional on domestic content requirements and export performance are prohibited. Yet, many other green industrial policy options are not affected by trade and investment law, such as feed-in-tariffs, performance requirements for training of staff, science and education policies, funded demonstration projects, and others. Procurement policies can be used to source greener products, yet not to discriminate in favour of domestic suppliers if governments are party to the WTO's plurilateral Government Procurement Agreement.

PART 4, country experiences, then examines the practical implementation of key policies in four countries at different levels of income and technological capacity: Morocco, China, Brazil and Germany. All examples address the simultaneous challenge of fostering jobs and technological learning and creating competitive advantages in new industries while greening their economies.

Vidican Auktor shows how Morocco uses its favourable conditions for energy generation from solar radiation and wind to reduce its enormous dependence from fuel imports, create employment and trigger technological learning. In 2011, the country was importing more than 95 per cent of its energy and its energy demand is expected to triple by 2030. Morocco's government not only encourages foreign direct investment in solar and wind energy projects but also supports related skills development and the emergence of domestic supplier industries. Moreover, policymakers foster both high-tech investments in concentrated solar power plants and low-tech rooftop solar thermal and photovoltaic projects to develop various segments of the labour market.

Altenburg, Feng and Shen provide an overview of China's policies to promote electric mobility with the dual aim of curbing urban air pollution and enhancing the competitiveness of its national automobile industry. That industry is strategic for China's technological upgrading, but it has not been able to reach the productivity levels of its international competitors so far. The shift to electric powertrains is therefore seen as an opportunity to boost national competitiveness by leapfrogging into a new generation of technologies. The government's comprehensive support package is unrivalled by any other country. Progress has been made in four areas of technology development: modern cars and buses, low-speed cars, two-wheelers and battery manufacturing.

Da Motta Veiga and Polónia Rios assess the role of policy in the emergence of the national bio-ethanol industry. Sugar cane cultivation and the industrial transformation of sugar into ethanol have received strong backing since the 1970s to replace gasoline consumption and decrease dependence on oil imports. More than 15 per cent of Brazil's energy demand is covered by ethanol, contributing to the country's low carbon footprint. The authors argue that the alleged direct negative effects on Brazils forest cover are largely unfounded, although some indirect effects may exist. High-yielding second generation sugar cane may further reduce these effects. Yet until recently, the government has designed its ethanol policy as a means to mitigate oil price fluctuations rather than for environmental purposes, and therefore cut support whenever oil prices were low. Also, despite some technological innovations, like the domestic development of new flex-fuel combustion engines, little has been undertaken to develop new industrial capabilities.

Finally, Pegels discusses the German Energiewende, the transition from coal and nuclear to renewable energy and enhanced energy efficiency, from the perspective of economic co-benefits. Her analysis shows that Germany has made considerable progress in the deployment of renewable energies for electricity generation, whereas other areas, such as energy efficiency, are lagging behind expectations. Regarding manufacturing industries, Germany's wind energy industry has emerged as a new global leader. Other sectors have been less successful. The solar panel industry boomed for some years but then experienced many bankruptcies due to competition from low-cost imports. Employment in Germany's environmental goods and services sector reached an estimated 260,000 jobs as of 2013. Also, rising electricity prices may have reduced the competitiveness of energy-intensive industries, a condition that is difficult to quantify.

Overall, the report provides a comprehensive overview of the rationale for environmental transformation, of the synergies and potential trade-offs among social, economic and environmental objectives and of different policy approaches and experiences of practical implementation in a wide range of country contexts. We hope it helps analysts and practitioners to accelerate the green transformation in a way that harmonizes societal objectives in the spirit of the 2030 Agenda for Sustainable Development.

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"The world is facing profound and inter-related challenges, from increasing inequalities and sluggish growth to crowded cities, pollution and climate change. The current development and growth models are unsustainable and require a structural change geared towards a big environmental push. This report must be an ongoing reference for policymakers seeking to foster domestic development by embracing more sustainable patterns of production and consumption."

ALICIA BÁRCENA
Executive Secretary of the Economic Commission for Latin America and the Caribbean (ECLAC)

"This publication highlights how countries across the world are using Green Industrial Policies to promote higher productivity and competitiveness, while increasing resource efficiency and decoupling economic growth from environmental degradation. As such, it represents an important addition to the green economy knowledge base and our common efforts to achieve the Sustainable Development Goals."

ACHIM STEINER
Administrator, United Nations Development Programme, and Head of the United Nations Development Group

"Excellent coverage of both theory and practical applications, anchored by country studies. This book shows the next step in the harmonious co-evolution of linked socio-economic and ecological systems, based on resource-efficient, industrial ecologies of the 21st century."

MOHAN MUNASINGHE
Vice Chairman of the United Nations Intergovernmental Panel on Climate Change (IPCC) in Geneva, Co-winner of the 2007 Nobel Peace Prize

"... a timely intellectual contribution with a practical guidance for the governments around the world to achieve green industrialization"

JUSTIN YIFU LIN
Director, Center for New Structural Economics, former Chief Economist, the World Bank

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