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2017

This project is supported by the International Climate Initiative (IKI) of the



Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety



Low-Carbon Development Frameworks

Transition Realism

**The implications of rent-seeking to achieve
South Africa's low-carbon technology ambition**

Author: Saliem Fakir

Available at: www.wwf.org.za/energy/report/transition-realism

Special contributors: The author would like to thank everyone involved for their collaboration and contributions which helped to improve the final paper.

Contact for WWF South Africa: Saliem Fakir, Head: Policy and Futures Unit, telephone +27 (0)21 657 6600, e-mail sfakir@wwf.org.za, www.wwf.org.za

Cover illustration: Shutterstock.com

Citation: Fakir, S. 2017. Transition Realism: the implications of rent-seeking to achieve South Africa's low-carbon technology ambition. WWF South Africa.

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The climate change mitigation debate in South Africa needs to move from improving efficiency within a projection of the existing economy, to innovation and options beyond the constraints of the current dispensation and structure of the economy. It may take step changes in the development path to achieve mitigation adequate to South Africa domestic and international commitments, and maximise economic development and social wellbeing. Business models presently unconsidered may be waiting in the wings.

The 'Low-carbon development frameworks in South Africa' project seeks to deepen understanding of, and reveal opportunities for, transitions to a low-carbon economy. It facilitates and develops contributions at the intersection of climate change mitigation, economic development and socio-economic dimensions, across immediate, medium and long-term horizons.

Working variously with government, business and labour, the project reaches from providing input to emerging government mitigation policies and measures; through investigating the business and socio-economic case for selected mitigation initiatives which hold growth potential in energy, transport, industry, waste, and land use; to analysing potential future economic trajectories and the systemic opportunities offered by these.

This paper is one in a set of Futures Framing papers to inform economic transition thinking. It attempts to provide an additional lens and theoretical framework to existing theories of sustainability transitions that seek to understand how low-carbon transitions can happen in an institutional setting of path dependence.

The project is funded by the International Climate Initiative (IKI) of the Federal Ministry for the Environment (BMUB) of Germany, and implemented by WWF South Africa.

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CONTENTS

Definitions	4
Background	6
The status quo: South Africa's dependence on coal	8
Frameworks to guide a low-carbon transition	10
Transition theory	10
The role of techno-economic shifts in transitions	11
Transition debates: How transitions happen	11
Perez's structural approach	12
Geels's multilevel perspective	13
Comparing the structural and the multilevel approach	15
The transition management model	16
Transition realism and rent models	18
Transition realism	18
North on systemic change and rent-seeking	18
Khan on curtailing piracy in emerging economies	24
Torvik on the effects of easy rents in resource-rich countries	25
A transition realism theory to support low-carbon interventions	26
Could self-interest and incentives drive a low-carbon transition in South Africa?	28

ABSTRACT

This paper is an attempt to provide an additional lens and theoretical framework to existing theories of sustainability transitions that seek to understand how low-carbon transitions can happen in an institutional setting of path dependence. A political economy understanding of transitions is more relevant in the context of developing and emerging economy countries that want to reduce their dependence on fossil fuels and adopt clean-energy technology solutions. The paper looks at techno-economic shifts or transitions from the point of view of how rent-seeking behaviour by different types of entrepreneurs – either political or productive entrepreneurs – shapes transitions from old to new techno-economic regimes. It posits that political entrepreneurship can influence the pace and scale of low-carbon transitions negatively and undermine the long-term benefits from these transitions. Transitions to low-carbon technologies suggest that the old political economy can be disrupted and readjust in a way that produces more inclusive economies and reduces negative rent-seeking.

DEFINITIONS

financialisation	the dominance of the financial sector in the economy
financial capital	the use of a variety of commercial capital to finance new technologies
forms of agency	actors playing a specific role in the economy
free-riders	people who use public goods freely without contributing to the costs of creating and maintaining those goods
lock-ins	technologies that have a long life-span, are capital intensive and involve direct economic activity that reinforces the same technological system
path dependence	the continued use of a practice or produce based on historical preference or use, even if more modern and efficient products or practices are available
piracy	a form of predatory rent-seeking
political economy	how a nation's political system interacts with the economy; and how different actors within that system have control and exercise power over politics and the economy
political entrepreneurship	a form of enterprising activity in which political influence rather than skill and business innovation is used to secure lucrative government contracts
production capital	innovation entrepreneurs
productive entrepreneurship	skilled individuals or companies seeking to use natural or other forms of capital to create new business opportunities by producing productive assets, goods or services for society
realpolitik	a system of politics or principles based on practical rather than moral or ideological considerations
rent	the surplus proceeds from investment flows that are well above reasonable profits for a specific class of infrastructure or assets
rent capture	when a few dominant players are able to capture most of the rents exclusively
rent-seeking	when the main purpose of seeking surplus profits is predatory rather than to ensure the vitality of the sector and economy
stock-of-knowledge	the body of accumulated knowledge in a firm or country
techno-economic shifts	a change from an economy based on one technological regime or system to another
transition theory	a conceptual framework about how fundamental shifts in a multilayered system could take place as a result of multiple drivers

BACKGROUND

South Africa is the tenth largest emitter of carbon dioxide (CO₂) globally – largely owing to the country's reliance on coal, given its rich endowment as a mineral resource.

10 TONNES OF CO₂
THE AVERAGE CO₂
EMISSIONS PER CAPITA
IN SOUTH AFRICA
WHICH EXCEEDS THE
GLOBAL AVERAGE

Moreover, despite accounting for only 1% of global Greenhouse Gas (GHG) emissions, the average per capita emissions of 10 tonnes of CO₂ per capita in South Africa exceeds the global average of 6.8 tonnes. To put this in context, South Africa's per capita emissions almost equal the European Union's average per capita emissions of 10.9 tonnes and are higher than China and India's per capita emissions.¹ This can be attributed to only a few segments of the economy where energy intensity and coal have had a long linked history and dictated the form of public and private spending on infrastructure. South Africa recognises this and has therefore committed to plateau its emissions between 2025 and 2035, and to reduce them thereafter.

To deal with South Africa's emissions trajectory, a set of scenarios was developed by a group of experts and stakeholders under the then Department of Environmental Affairs and Tourism. The early phase of this process was mediated through the Long Term Mitigation Scenarios (LTMS) that were developed by the Department of Environmental Affairs and Tourism.²

These scenarios were largely seen as defining the Peak, Plateau and Decline (PPD) projections that were embraced by South Africa's National Climate Change Response Paper.³ The LTMS laid the basis for developing a long-term decarbonisation vision, the aim of which was to drive carbon emission reductions as fast as possible through various interventions such as the ramping up of low-carbon technologies, the use of energy-demand management tools, incentivising technology switch options in the production system and inducing behavioural change through instruments such as carbon budgets and carbon taxes.⁴

The LTMS provided the basis for different types of long-term emissions profiles that could prevail under different conditions and offered different pathways for reducing the emissions profile in the worst-case scenarios.⁵ Given that the LTMS is a technical scenarios exercise, it by default presents various technology and non-technology pathways as linear trajectories.

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- 1 DEA. 2012. "National Climate Change Response White Paper." Pretoria, South Africa: Department of Environmental Affairs, South African National Government. https://www.environment.gov.za/sites/default/files/legislations/national_climatechange_response_whitepaper.pdf.
 - 2 Department of Environment Affairs and Tourism. 2007. Long Term Mitigation Scenarios: Strategic Options for South Africa. Prepared by Scenario Building Team. Available at: https://open.uct.ac.za/bitstream/handle/11427/16804/Scenario_Building_Team_Long_Term_Mitigation_2007.pdf?sequence=1.
 - 3 http://www.gov.za/sites/www.gov.za/files/national_climatechange_response_whitepaper_0.pdf.
 - 4 Department of Environment Affairs and Tourism. 2007. Long Term Mitigation Scenarios: Strategic Options for South Africa. Prepared by Scenario Building Team. Available at: https://open.uct.ac.za/bitstream/handle/11427/16804/Scenario_Building_Team_Long_Term_Mitigation_2007.pdf?sequence=1.
 - 5 Winkler, H. 2009. *Cleaner Energy, Cooler Climate: Developing Sustainable Energy Solutions for South Africa*. Pretoria: HSRC Press.

POLITICAL ECONOMY

HOW A NATION'S
POLITICAL SYSTEM
INTERACTS WITH
THE ECONOMY; AND
HOW DIFFERENT
ACTORS WITHIN
THAT SYSTEM HAVE
CONTROL AND EXERCISE
POWER OVER POLITICS
AND THE ECONOMY

In reality, these transition pathways are by nature complex and non-linear in character, therefore, as will be demonstrated in this paper, a **political economy** approach is more suitable and gives a nuanced and different texture to these pathways, and will define the choice of technology and the pace and scale at which they will be adopted.

The main limitation of the LTMS is that it did not conceptualise a transition theory or framework by which to understand how a low-carbon transition is likely to evolve given South Africa's coal dependence and its political economy. Coal constitutes a significant supply of electricity and a sizeable portion of the liquid fuel needs of the country.

In South Africa, in 2014, coal accounted for 70% of the primary energy mix, and 92% of the electricity generation capacity in the country.⁶ The energy sector is the single largest source of GHG emissions, accounting for about 79%⁷ of the country's total emissions if one includes the production of liquid fuels from coal-to-liquid plants at Sasol.⁸

TRANSITION THEORY

A CONCEPTUAL
FRAMEWORK
ABOUT HOW
FUNDAMENTAL SHIFTS
IN A MULTILAYERED
SYSTEM COULD TAKE
PLACE AS A RESULT OF
MULTIPLE DRIVERS

The main aims of this paper are to present the following theories and insights as far as they pertain to the transition to a low-carbon technology in South Africa as an example of an emerging economy and developing country:

1. **Transition theory or framework:** The **transition theory** presented in this paper shows how a low-carbon transition could evolve. It draws on insights from the existing literature and offers alternative options to the most dominant academic articulations of transition theory. Although mainstream theories offer useful insights on the complexities of change, they, like all theories, have limited explanatory power and contain gaps in so far as they may not adequately capture transitions if we apply a political economy lens to the transition debate.
2. **Why and how transition do or do not happen:** This paper offers theoretical insight as to why and how transitions do or do not happen in emerging economies. It posits that transitions are gradual processes because they are as much a product of technological evolution and adoption as they are of the economic interests and incentives that determine the pace at which these transitions can happen.
3. **Rent-seeking theories:** The paper argues that generic models of transition do not explain change, whereas theoretical perspectives from institutional economics and **rent-seeking** theories better explain transition mechanisms as far as they pertain to emerging economies and developing countries. In particular, the paper suggests that analysing how the system of rents works and how this system is maintained by actors or groups of influence will provide a better insight into how transitions are mediated in society or why they do not happen at all. It proposes that actors and their relation to state power define policy choice and skew state resource allocations towards specific types of economic activity and investment trends.

The aim of this paper is thus to build on the legacy of the LTMS and develop a theoretical framework that seeks to articulate a realistic approach to the transition debate.

RENT-SEEKING

WHEN THE MAIN
PURPOSE OF SEEKING
SURPLUS PROFITS
(RENTS) IS PREDATORY
RATHER THAN TO
ENSURE THE VITALITY
OF THE SECTOR AND
ECONOMY

6 http://www.iea.org/ciab/South_Africa_Role_Coal_Energy_Security.pdf

7 https://www.environment.gov.za/sites/default/files/docs/greenhousegas_inventorysouthafrica.pdf

8 Sasol was a state-owned company set up by the apartheid government to secure liquid-fuels production during an era of sanctions by converting coal to liquid fuels using the Fischer-Tropsch technology developed in Germany. Today Sasol is wholly privatised and has developed a long-term strategy of exiting coal as feedstock to gas.

THE STATUS QUO: SOUTH AFRICA'S DEPENDENCE ON COAL

To grasp the challenge lying ahead for new technologies that drive a low-carbon transition, it is important to understand the importance of coal and its political economy in South Africa's energy sector. South Africa's high dependence on coal is a result of a natural endowment.

PATH DEPENDENCE

THE CONTINUED USE
OF A PRACTICE OR
PRODUCE BASED
ON HISTORICAL
PREFERENCE OR
USE, EVEN IF MORE
MODERN AND
EFFICIENT PRODUCTS
OR PRACTICES ARE
AVAILABLE

Coal has been critical to the development of South Africa's industrial capability⁹ and economic diversification as it was a cheap energy source. Cheap energy was critical to the mining sector and other energy-intensive industries such as steel making, smelting and the development of railways, construction and other industries. Coal is also important in other ancillary industries such as heavy manufacturing and the chemical industries. Coal usage has enabled South Africa to become the most industrialised economy in Africa but has also created a certain **path-dependent** form¹⁰ of industrialisation and exports in which heavy industry and mining remain at the heart of its industrial trajectory and exports.¹¹ As far as the transition debate goes, the focus of this paper is primarily on the electricity sector and coal's past and future role in that sector.¹²

The long history of coal and its multiple linkages in the South African economy has ensured that there is a tight coupling between coal and the economy, primarily because the abundance of coal has allowed energy to become an essential feature of energy-intensive production and the economy in general.¹³ Coal has been used as an industrial development policy tool to harness the enormous wealth and diversity of South Africa's rich mineral endowment. Coal usage has facilitated links into downstream industries, creating a broad and loosely defined Minerals Energy Complex (MEC).¹⁴ The MEC has been described by some as a unique feature of a system of accumulation in which the minerals and energy sectors are intertwined.¹⁵

9 Verhoef, G. 1998. *Industrialization in South Africa: A Historiographical Debate?* New Contree, originally published in Afrikaans in *Historia* 43(1), also available at: [http://dspace.nwu.ac.za/bitstream/handle/10394/6307/No_44\(1998\)_Verhoef_G.pdf?sequence=1](http://dspace.nwu.ac.za/bitstream/handle/10394/6307/No_44(1998)_Verhoef_G.pdf?sequence=1).

10 Some of the insights on path dependence theory can be drawn from the work of Douglass North, who was an institutional economist.

11 Fine, B. & Rustonjee, Z. 1996. *The Political Economy of South Africa: From Minerals Energy Complex to Industrialisation*. Johannesburg: Witwatersrand Press.

12 Davenport, J. 2013. *Digging Deep: A History of Mining in South Africa*. Cape Town: Jonathan Ball. The book provides a good overview of the history of mining in South Africa and the role of coal.

13 See Creamer Media. 2016. Coal 2016: A review of South Africa's coal sector. Available at: <http://www.creamermedia.co.za/article/coal-2016-a-review-of-south-africas-coal-sector-pdf-report-2016-12-14>.

14 See Fine & Rustonjee (note 11).

15 Ashman, S., Fine, B. & Newman, S. 2012. Systems of Accumulation and the Evolving MEC. In B. Fine, J. Saraswati & D. Tavasci (eds). *Beyond the Developmental State: Industrial Policy in the 21st Century*. London: Pluto, in preparation).

FINANCIALISATION

THE DOMINANCE OF THE FINANCIAL SECTOR IN THE ECONOMY

The high use of coal, which has dominated the South African legacy for close to a century, will be much more constrained in the future.

Given that the MEC sectors are by nature capital intensive, policies have inadvertently structured incentives in a manner that has further enhanced the capital intensity of the economy.¹⁶ Capital-intensive investments are also infrastructural assets that have long life-spans and so further entrench the longevity of path dependence. In recent years there have been renewed policy attempts to improve the beneficiation streams and linkages between mining and industrial development and stimulate economic development. However, the extent to which these linkages can be fostered in a significant way remains a challenge.¹⁷ Coal's penetrative cross-linkages with various components of the economy has made it the most compelling energy carrier and it will not be easily matched by other carriers without significant effort and resource availability. This is why path dependence will remain a strong feature of the coal economy given its multifaceted dimensions and its embeddedness in the economy from mining, exports and the **financialisation**¹⁸ of coal assets.¹⁹ Coal is also a significant contributor to job creation and generating export earnings.

Coal has dominated the South African economy for close to a century owing to its domestic abundance, diverse use versatility and cheapness. However, as already noted, many factors are narrowing the window that makes coal the preferred fuel for energy. These factors vary from declining reserves,²⁰ supply constraints, the quality of coal²¹ and the global price of coal owing to climate change issues. Large deposits may even remain unexploited owing to a lack of financing and infrastructure. The high use of coal, which has marked the South African legacy, will be much more constrained in the future.²² Coal production and transport costs will also increase because poor-quality coal needs more washing and new mines will not be located

in close proximity to coal-fired power plants. To summarise: the dependency on coal is fast approaching natural and non-natural limits. These alone point to the need for a reassessment of South Africa's total reliance on coal and the need for crafting a pathway out of coal path dependence.

GERHARD ROUX, COMMONS WIKIMEDIA.ORG



The Arnot Power Station in Middelburg, South Africa, is one of seventeen operational coal-fired plants.

- 16 Black, A. & Hasson, R. 2012. Capital intensive industrialisation and comparative advantage: can South Africa do better in labour demanding manufacturing. Paper presented at the Strategies to Overcome Poverty and Inequality 'Towards Carnegie III' Conference held at UCT, pp. 13–16.
- 17 Turok, B. 2012. Beneficiation of mineral resources: the key to economic development, *New Agenda*.
- 18 While coal is an asset in its own right, it is also traded on global exchanges. The availability of coal-traded futures contracts, the listing of stocks of coal companies and debt instruments such as bonds issued by coal companies or coal-dependent power plants are all aspects of the financialisation of the coal sector.
- 19 Gas is the only other energy source that can offer similar complementarities as coal. See Lee, A., Zinaman, O. & Logan, J. 2012. Opportunities for Synergy Between Natural Gas and Renewable Energy in the Electric Power and Transportation Sectors, Technical Report, NREL/TP-6A50-56324, NREL, USA, also available at: <http://www.nrel.gov/docs/fy13osti/56324.pdf>.
- 20 Hartnady C. 2010. South Africa's diminishing coal reserves. *S Afr J Sci.* 2010;106(9/10), Art. #369, 5 pages. DOI: 10.4102/sajs.v106i9/10.369. Available at: <http://www.sajs.co.za/sites/default/files/publications/pdf/369-2707-5-PB.pdf>.
- 21 See an interesting article by Xavier Provost at <http://www.xmpconsulting.com/articles/Article%20SA%20COAL.pdf>.
- 22 See Eberhard, A. 2011. The Future of South African Coal: Market, Investment and Policy Changes, PESD, Report No. 100, also available at: http://iis-db.stanford.edu/pubs/23082/WP_100_Eberhard_Future_of_South_African_Coal.pdf.

FRAMEWORKS TO GUIDE A LOW-CARBON TRANSITION

Transition theory

South Africa's commitment is to plateau its carbon emissions between 2025 and 2035, and to reduce them thereafter.

A transition, as defined in academic literature, is a fundamental shift in a given functional system involving technologies, markets, user practices, institutions, policies and cultural discourses.²³ It is at once a product of a singular technological effect, and a wave of ancillary effects that create an entire economy-wide ecosystem around it. Transitions can take the form of large-scale transformation of society and small-scale transformation of a more limited sphere.

Large-scale transformations tend to force the reorganisation of society and the economy.²⁴ The industrial revolution is an example of a large-scale transformation of society brought about by a shift to new, technology-driven forms of production that were based on a new energy system – in this case abundant supplies of coal and the invention of the ubiquitous steam engine. The transformation took place across all western-led industrial sectors and created a wave that disrupted pre-existing patterns of social interaction and organisation. Thus large-scale techno-economic shifts are facilitated by what is referred to as general-purpose technologies such as the steam engine, the dynamo and the Internet.

In contrast, smaller-scale transformations affect specific sectors. An example is the Green Revolution in agriculture or the introduction of renewable energy sources in a fossil-fuel-dominated electricity sector.²⁵ Changes in the energy sector, such as increasing the market share of renewable energy,²⁶ could introduce a techno-economic shift but will not lead to the widespread system change that followed the replacement of wood with coal during the industrial revolution, for example.²⁷

23 Perez, C. 1986. The New Technologies: A Integrated View. Working Papers in Technology Governance and Economic Dynamics, No. 19. Tallinn University of Technology, Norway. Available at: <http://hum.ttu.ee/wp/paper19.pdf>.

24 A seminal work that demonstrates this very clearly is E.P. Thomson's book, *The Making of the English Working Class* (1963, London: Victor Gollancz Ltd Vintage Books) about the relationship between the industrial revolution, the effects of technology and the rise of the working class.

25 Van den Bergh, J. & Kemp, R. n.d. Economics and Transitions: Lessons from Economic Sub-disciplines. UNU-Merit Working Papers: ISSN 1871-9872, also available at: <http://kemp.unu-merit.nl/docs/Economics%20%20transitions%20-%20vandenBergh%20%20Kemp%20-%20%20Final.pdf>.

26 Mathews, J.A. 2012. The Renewable Energies technology surge: A new techno-economic paradigm in the making? Working Papers in Technology Governance and Economic Dynamics, No. 44. The Other Canon Foundation, Tallinn University of Technology, Norway.

27 Lovelock, J. 2015. *A rough ride to the future*. London: Penguin Books.

The theory of transition,²⁸ also referred to as socio-technical transitions, is not based on a single discipline or school of thought.²⁹ Rather, it is described through a synthesis of ideas, processes and concepts that have come to be collectively called transition theory.³⁰ This theory seeks to frame our perspectives on how multilayered system transitions could take place as the result of multiple drivers. However, transition theory provides only a conceptual framework of how transitions could happen based on experience and the study of major techno-economic shifts experienced in modern society.³¹

Although heuristic models or theories of techno-economic change guide our framing, they do not tell us how systemic or economically inclusive changes of this nature will be nor how best to manage these transitions.

The role of techno-economic shifts in transitions

TECHNO-ECONOMIC SHIFTS

A CHANGE FROM AN ECONOMY BASED ON ONE TECHNOLOGICAL REGIME OR SYSTEM TO ANOTHER

It is important to note that this paper will rely on the term **techno-economic shifts** as the primary conceptual framework for discussing transitions as processes that result from the insertion of new technologies, whether in the economy as a whole or in a specific sector. Techno-economic shifts can also be understood as having a displacement effect: one constellation of technologies is replaced by another through a process of transition and universal transformation.

Some studies suggest that techno-economic shifts can be extensive and deep in many economies.³² Technological change can be a source of new growth, but it will depend on how the system as a whole reacts to such a change. Ill-timed introductions or the adoption of technologies when the lowest cost structures³³ of those technologies have not yet been realised – such as solar panels in a developing economy with poor infrastructure – can burden an economy struggling to get out of a slump.

New technology can offer opportunity and flexibility, but its phasing in has to be aligned with an upward growth phase in the economy and, where the technology itself is fast evolving, with the lowest cost structures and improved technical performance of that particular technology.³⁴

28 See http://www.visionsandpathways.com/wp-content/uploads/2014/06/Twoomey_Gaziulusoy_Innovation-and-Transition-Theory.pdf.

29 Geels, F.W. 2002. Technological transitions as evolutionary reconfiguration processes: a multilevel perspective and a case study. *Research Policy*, 31:1257–1274.

30 This is the author's own assessment of the literature and is a description of a collection of concepts that provide various permutations of the underlying conception of transition. The author describes these as transition theories, which will be outlined in more detail later in the paper.

31 See Shackley, S. & Green, K. 2007. A conceptual framework for exploring transitions to decarbonised energy systems in the United Kingdom. *Energy*, 32:221–236.

32 Deng, Y.Y., Blok, K. & Van der Leun, K. 2012. Transition to a fully sustainable global energy system. *Energy Strategy Reviews*, 1(2):109–121. Available at: <http://dx.doi.org/10.1016/j.esr.2012.07.003>.

33 See Farmer, J.D. & Lafond, F. 2016. How predictable is technological progress? *Research Policy*, 45:647–665.

34 See Rodrik, D. 2011. Unconditional Convergence, National Bureau of Economic Research. Working Paper 17546. Available at: <http://www.nber.org/papers/w17546>. The paper argues that countries adopting identical technologies will not necessarily converge to produce the same economic growth rates and performance outcomes.

Transition debates: How transitions happen

Some key points relevant to the discussion at hand are presented by Perez and Geels, two eminent transition theorists, and others.

Perez's structural approach

In Perez's³⁵ view, transitions involve technological innovations or shifts that also include new management and production practices as part of the milieu of techno-economic innovation. These shifts are said to occur through two broad processes.

FINANCIAL CAPITAL

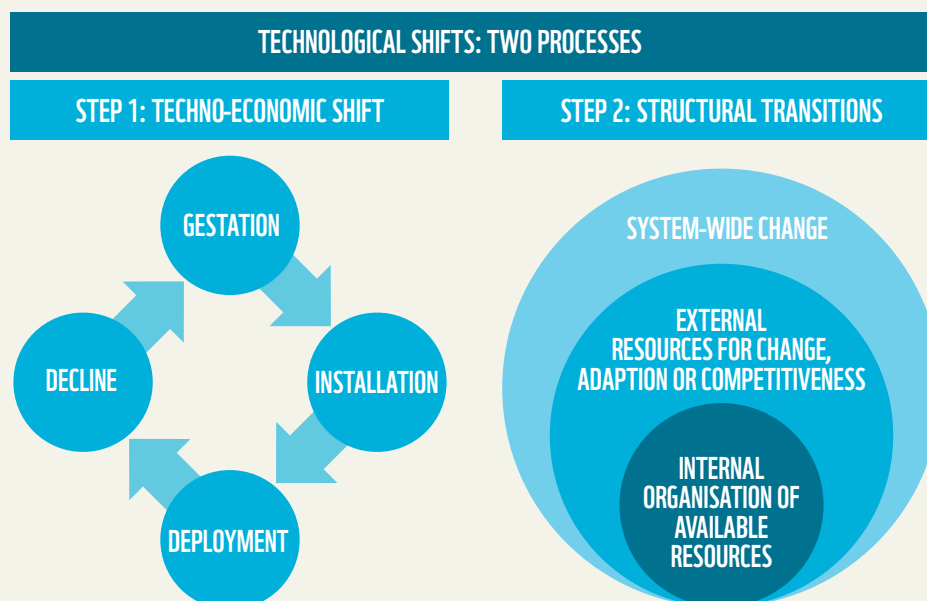
THE USE OF A VARIETY
OF COMMERCIAL
CAPITAL TO FINANCE
NEW TECHNOLOGIES

During the first process, the technology is taken from conception to the commercial stage (which is largely dominated by **financial capital**) and then later into implementation (which is a result of **production capital** or the involvement and dominance of entrepreneurs). In general, the pattern of techno-economic shifts is usually characterised by several elements: gestation, installation, deployment and decline (through new inventions and modernisation).

PRODUCTION CAPITAL

INNOVATION
ENTREPRENEURS

The second process concerns the system in which techno-economic change is happening. This involves system-wide adoption, the internal organisation of available resources and the harnessing of new resources externally for the purposes of change, adaption or competitiveness. Internal resources may be insufficient to bring about change and wider external networks and collaboration are required to facilitate the adaptation process. This – together with innovation systems, better enabling environments and learning – aids the adaptation to new types of regimes or systems. Often, techno-economic shifts happen in a systems vacuum or the rapid rise of the technology creates uncertainty. As a result, the system or regime then adjusts and begins to create system-wide rules that allow for even more rapid integration and adoption of the new technology.



³⁵ Perez, C. 2002. *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages*. Cheltenham: Edward Elgar Publishing.



Perez's work was influenced by Schumpeter and his conception of 'creative destruction', which he saw not only as a source of disruption but also as a change in the productive capacity of capitalism.³⁶ These disruptions are general in nature, in that they have systemic effects and usually produce change ahead of the ability of social, legal and economic institutions to adapt to the new techno-economic shift. Perez takes a cue from Schumpeter's insight and links the role of financial and productive capital in the making of technological revolutions.

Geels's multilevel perspective

Mainstreaming of new technologies over old ones need to be accompanied by concomitant changes in markets, user practices, shifts in policy and cultural discourses. New governing institutions and regulatory frameworks also need to be developed. Techno-economic shifts can also be seen as competing with incumbent energy systems, which in many cases they are. As a result – and inevitably – these shifts create competitive conditions that require institutional change and the revision of the 'rules of the game'. Incumbent regimes may adapt or leave it too late.

If **lock-ins** allow incumbents to monopolise incentives and **rents**, techno-economic shifts can break the existing patterns of monopolisation through increased competition for the same rents and incentives.³⁷ Policies and regulations that favour new technologies inevitably rupture the flow of incentives from the old to the new. For instance, the introduction of carbon pricing begins to level the playing field for new, cleaner technologies against carbon-intensive technologies. Carbon pricing becomes a regulated cost that reduces the rents that an incumbent technology system can extract compared to a period in which no carbon pricing existed.

The nature, pace and scale of transition are determined by dynamic interactions between different actors within and outside current systems, and their ability to act and influence others to act.³⁸ The extent to which the resources that enable adaptation come from inside or outside the incumbent regime as well as the level of coordination for the deployment of these resources determines the rate of adoption. The core of Geels's thesis is that these interactions take place at three levels (Figure 1): the socio-technical landscape, the socio-technical regime and technological niches.³⁹

- **Landscapes** refer to general socio-economic and cultural spheres of influence and aspects outside the realm of systems that place pressure on a regime, such as global changes in weather patterns or geopolitical shifts.
- **Regimes** are socio-political and technological systems that are determined by the unique normative set of rules and economic and physical features of a country. A regime is characterised as a set of entrenched institutional and regulatory architectures that embed a system in a particular mode of technology choice and associated practices.

36 This is in reference to Schumpeter's book *Capitalism, Socialism and Democracy* (1975, New York: Harper Perennial). Interestingly, Schumpeter's thesis on creative destruction is influenced by Marx's theory of how capitalism destroys itself from inside.

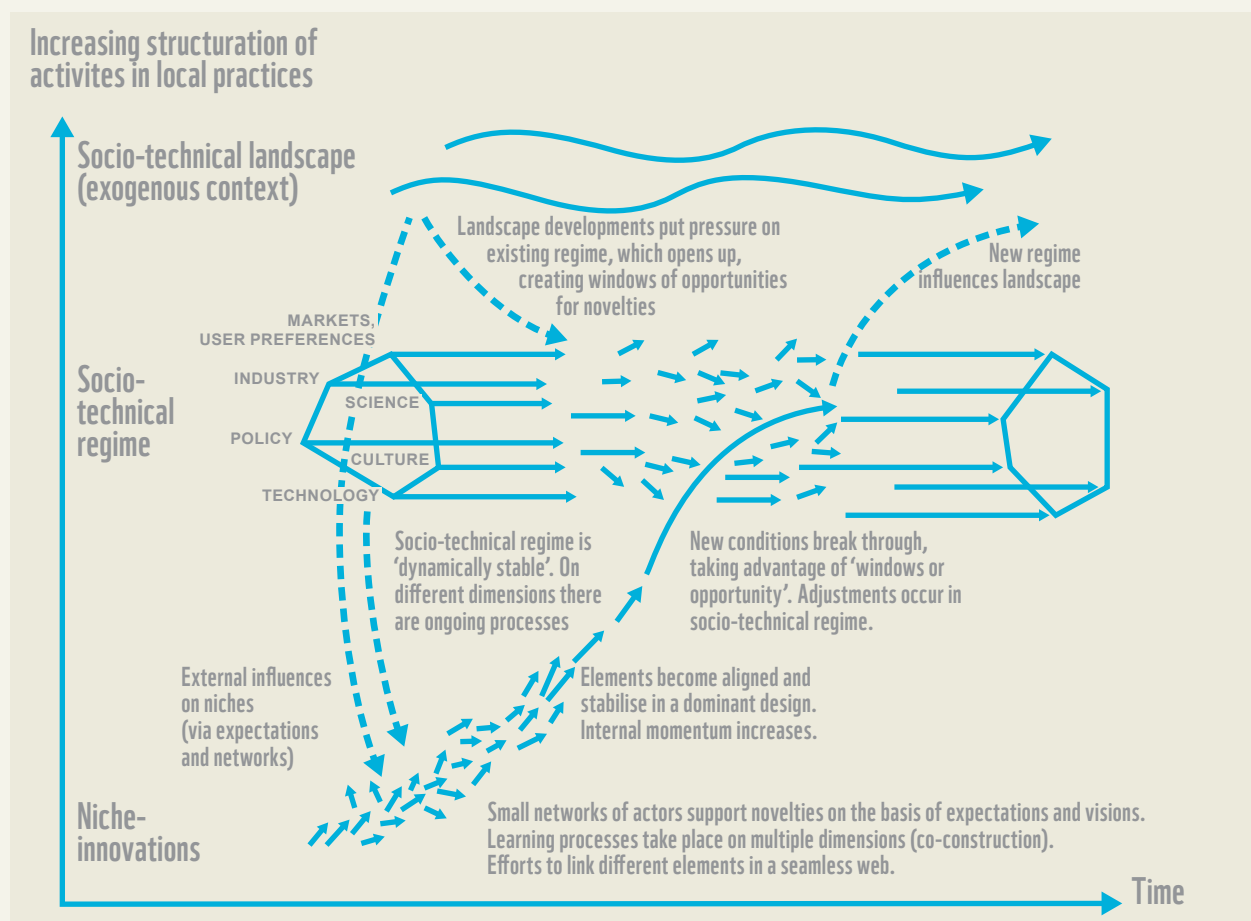
37 Some useful insights can be drawn from the work of Douglass North even though the following paper may not deal directly with the theme of techno-economic change in the energy sector. See North, D.C. n.d. *Economic Performance Through Time: The Limits of Knowledge*. Washing D.C.: Washington University. Available at: <http://econwpa.repec.org/eps/eh/papers/9612/9612004.pdf>.

38 Smith, A., Stirling, A. & Berkhout, F. 2005. The Governance of Sustainable Socio-Technical Transitions. *Research Policy*, 34:1491–1510.

39 Geels, F.W. & Schot, J. 2007. Typology of sociotechnical transition pathways. *Research Policy*, 36:399–417.

- **Niche technologies** are attempts to trial new technologies and practices that do not as of yet disrupt an existing regime but recognise that landscape pressures on the system will inevitably shift the regime to begin the necessary reforms to accommodate new techno-economic changes.

Figure 1: Multilevel perspective of transition



SOURCE: GEELS, 2011: 28

The theory of transition as a dynamic interaction between actors is complemented by the multilevel perspective (MLP) of transitions.⁴⁰ This theory also accommodates the opportunity that technology niches create for technology transformation when the whole system does not seem to be mobilised behind new technology waves. Geels regards technology niches as 'protected spaces' for the incubation of ideas.⁴¹ In these spaces a community of learning can experiment, develop novel ideas and learn by doing, relatively quarantined from the mainstream or selection forces brought about by the dominance of other technologies and practices in the market. In a broader sense, niches refer to the development, demonstration and piloting of new technological options.

40 Geels, F.W. 2004. Understanding system innovations: a critical literature review and a conceptual synthesis. In B. Elzen, F.W. Geels & K. Green (eds). *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy*. Northampton: Edward Elgar Publishing.

41 Geels, F.W. 2004. From sectoral systems innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory, *Research Policy*, 33:897–920.

Differences in the timing and nature of interactions between different forms of agency in the economy determine the capacity for the adoption of new technologies, the scale of the ultimate transition and the different forms in which transitions from one regime to another occur. Niche technology initiatives can enhance national capability and at the same time foster international collaboration. This is how ideas spread and new technologies diffuse into real economies over time.

Transitions inevitably involve difficult structural changes as the existing and often unsustainable systems are stabilised through various lock-in mechanisms, such as economies of scale, sunken investments, technological path dependence, infrastructure, behavioural patterns, preferences and user practices, competencies, favourable subsidies and regulations and vested interests. These lock-in mechanisms create path dependence and make it difficult to dislodge the existing systems. The regime is tightly knit and almost impenetrable because of the embedded institutional features that protect a system of mutually co-dependent activities and interests.

Comparing the structural and the multilevel approach

What does each of these approaches have to offer? Geels's multilevel perspective on transitions can be regarded as a 'middle-range theory' drawing insights on how transitions occur from various theoretical perspectives⁴² and is specific to sector transitions. Perez's model, by comparison, envisages structural transitions that occur across the economy, leading to system-wide change. She places great emphasis on the role of finance and productive capital.

Geels also differs from Perez in two other respects. He regards transitions (when the objectives are sustainability outcomes) as goal-orientated or purposive rather than emergent, in that they seek to solve a public goods problem – given that cleaner technologies are more likely to be expensive and require extensive investment in research and development before they can be commercially scaled-up. A case in point is the ongoing challenge of making carbon capture and storage commercially viable to deal with carbon dioxide emissions from coal plants.

Also, unlike Perez, Geels does not see transitions as lying outside a specific market- or production-related challenge that incentivises private entrepreneurs to innovate in order to reap exclusive commercial benefit. In the case of purposive transitions, transitions are more an outcome of planned processes than something that is organic or injected into an existing techno-economic system through spontaneity and disruption.

Furthermore, because these technologies are purposive and seek to resolve a public goods problem, they are more likely to be led by the state or public sector institutions. Private firms may see public goods technologies as high risk since these technologies are not fully developed and the technologies can be subject to the **free-rider**⁴³ problem. In any case, these technologies have to solve technology performance risk, demonstrate long-term price performance and finally ensure consumer acceptance and uptake. This would require favourable economic policies such as subsidies and taxes which, as we will show later, will undoubtedly be met with resistance from incumbent technology providers and vested interests.

FREE-RIDERS
PEOPLE WHO USE
PUBLIC GOODS
FREELY WITHOUT
CONTRIBUTING TO THE
COSTS OF CREATING
AND MAINTAINING
THOSE GOODS

⁴² Geels, F.W. 2011. The multilevel perspective on sustainability transitions: responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1:24–20.

⁴³ Geels is echoing the work of Mariana Mazzucato. See Mazzucato, M. 2013. Financing innovation: creative destruction vs destructive creation. *Industrial and Corporate Change*, 22(4):851–867.

For new technologies to be adopted, a whole suite of factors needs to be coordinated and come into play to lower risk, enhance performance and enable the economies of scale needed for take-off.

Geels's work on transitions theory also focuses on the resistance of the techno-economic regime to the forces of change. As he notes, "...the socio-technical regime forms the 'deep structure' that accounts for the stability of the existing socio-technical system." Perez's work seems to suggest that techno-economic shifts are unstructured, organic, spontaneous, disrupting and only seem to generate a vision as an afterthought. In contrast to Geels, she holds the view that techno-economic transitions are an outcome of the relation between production capital (the innovation entrepreneurs) and financial capital (the bets finance is willing to take on new technologies and markets). Despite having a different modus operandi and reasons to exist, each is a key factor in the dynamics of techno-economic shifts.

The transition management model

For large-scale sustainability innovations, government policy reform must be a product of consensus, shared strategic vision and incorporate a diversity of views and interests.

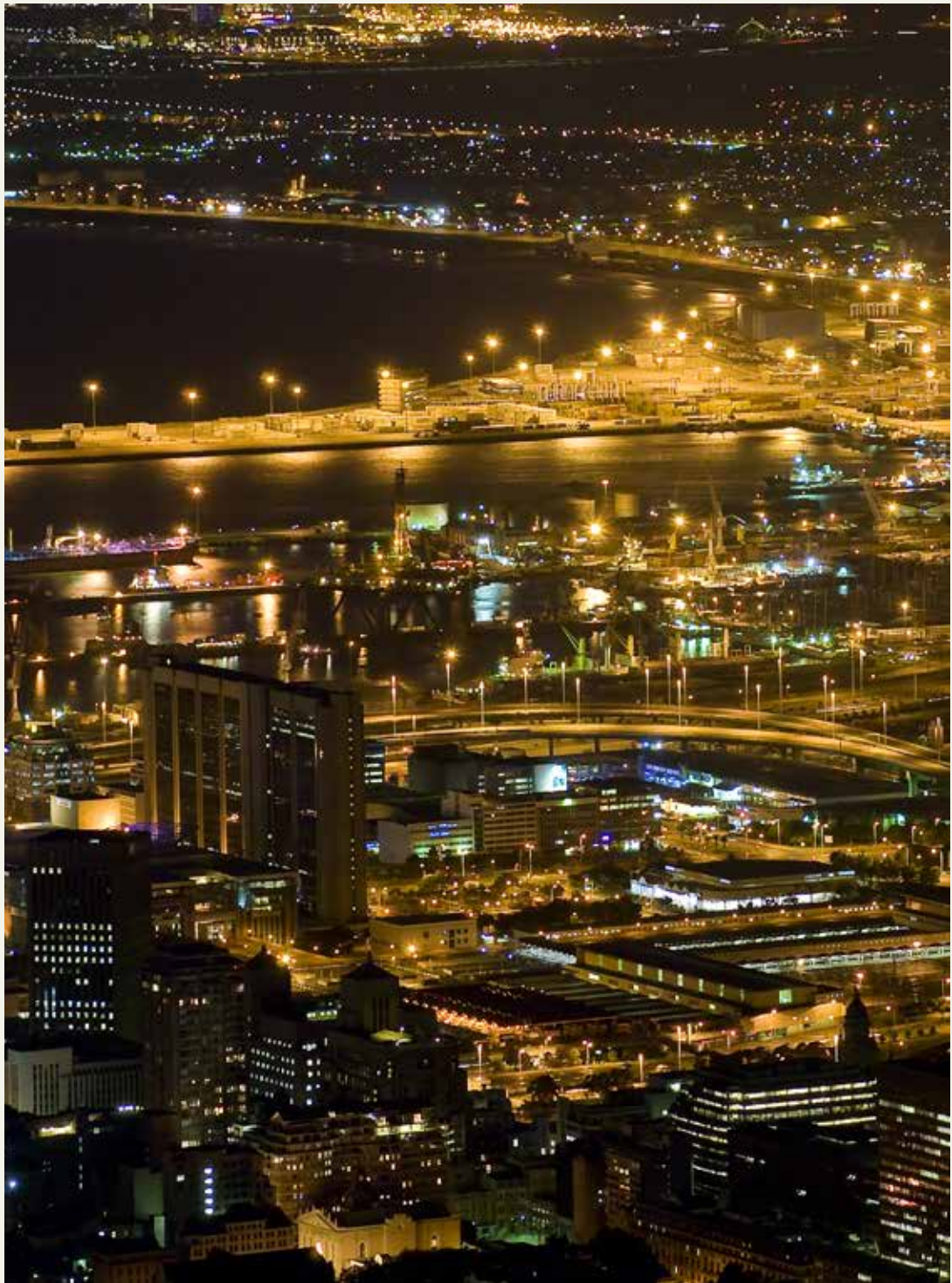
A complementary thesis to the transitions debate of Perez and Geels is the transition management model.⁴⁴ It pivots transition management as a product of a specific governance model in which government policy is a product of consensus between different social actors or forces in society rather than top-down policy making. It relies on complexity and systems theory to inform the underlying philosophical assumptions for its practice and mode of thinking through challenges and solutions. Transition management argues that modern industrialised societies require a different model of governance that is 'reflexive' in nature. Reflexivity draws on the premise that society is complex, therefore governance through incorporating a diversity of views and interests is the best way to drive large-scale sustainability innovations.

These new models of governance can create a shared vision and social networks for policy reform. On the practical side of transition management, actors inform transition by defining a strategic vision for the future, being tactical in how they negotiate reform, performing operational activities that set in motion innovations, and having the ability to monitor progress and adjust policies or rules. In a sense, the consensus building and operationalisation of practices are intended to 'normalise' a state in transition.⁴⁵

Application of the transition management model could work well in highly mature democracies and in countries with low inequality. The model's emphasis on consensus building obscures the power of elites and vested interests to subvert or shift policy even after it has been agreed upon. However, it may not be conducive for purposive technological change that needs to happen rapidly given the challenge of climate change.

44 See more detailed coverage of this concept in Loorbach, D.A. 2007. *Transition Management: New Mode of Governance for Sustainable Development*. Rotterdam: Erasmus University.

45 Loorbach, D. 2010. Transition Management for Sustainable Development: A prescriptive, complexity-based governance framework. *An International Journal of Policy, Administration and Institutions*, 23(1).



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The energy requirements of the city of Cape Town at night.

TRANSITION REALISM AND RENT MODELS

Transition realism

REALPOLITIK

A SYSTEM OF POLITICS
OR PRINCIPLES
BASED ON PRACTICAL
RATHER THAN MORAL
OR IDEOLOGICAL
CONSIDERATIONS

In contrast to the theories highlighted above, this paper proposes a transition theory based on ‘transition realism’ that is informed by our understanding of the **realpolitik** that an incumbent system of technology is locked into. Transition realism draws on the economic theories of North, Khan and Torvik,⁴⁶ who articulate the intersection of market power, special interests and state and economic policies that facilitate a flow of rents towards a specific techno-economic regime. Lock-ins and path dependence are products of this rent regime and will be sustained as long as these rents are available.

Transitions never go according to plan⁴⁷ and are dictated or shaped by a country’s political economy. Or, putting it bluntly, moral imperatives to solve things like climate change will not bring about large-scale technology investment and shifts unless material interests are negatively affected or directed towards new things. In other words, a new technology regime is not possible unless it is purposive and enabled through various types of policy reforms and incentives.

Accordingly, we also need to be mindful of the fact that a set of policies for technology transformation in one country can produce different outcomes and economic shifts in another country, even though both countries are engaged in the transformation of their economies through the same technological change. The differences in why adoption outcomes differ can only be uncovered once we treat transitions not as abstract concepts but as a product of the interaction between institutional systems and the vested interests of established actors in the economy. Furthermore, it is critical to understand the notion of political economy as activities of organised groups, lobbies or coalitions engaged in shaping the institutional framework, and the way in which it shapes rent distribution (or income share) within an economy.

North on systemic change and rent-seeking

North’s⁴⁸ insights are useful for the transitions debate, as system institutional change marks a shift in the rules of the game and incentives. North’s main point is about systemic change that creates an incentive and a rule framework in which new technology innovation and entrepreneurship begin the evolution from one system to another. The existing system may choose to divert rents (incentives) away from the

North’s main point is about systemic change that creates an incentive and a rule framework in which new technology innovation and entrepreneurship begin the evolution from one system to another.

46 Further reference to these authors will be made later in this work. Although it is not covered in this paper, further impetus to our understanding of transition realism can be found in the scholarly works of Muzzacuto, who suggests that new technology transitions are not happening and will not happen as long as private finance has a short-term focus and seeks high rates of return.

47 By this we mean that suggesting a roll-out of clean technology solutions, as a case in point, is not automatic. Scaling of new technology adoption can go through ups and downs. It is dependent on how well the new technologies are aligned with prevailing economic interests.

48 Douglass C. North received the Nobel Prize for economics in 1993.

*Institutions
are the rules
of the game;
organisations the
players.*

incumbent system to the new. In the case of North's framework, institutions are the rules of the game and organisations⁴⁹ are the players within that rule-bound system. For instance, changes to the rules of the game and incentives for coal use make any future coal power production a constrained economic environment. Even existing power plants face these constraints. They either fight to retain the status quo or begin a process of adaptation and transition.⁵⁰

Institutional framework

Linking back the previous section, it is worth noting that institutions are to North what regimes are to Geels. Or, put differently, for Geels the regime is the place where the rules of the game are set.

Institutional change

*Institutional
change = change
in the regime,
how this happens,
and what process
underpins this
change.*

When North speaks of institutional change he means, in Geels's terms, changes in the regime and how they are brought about. In addition, he describes the mechanism and process underpinning this institutional change – an element that is missing in Geels's theoretical framework. A second concept that is relevant here and also used by Geels and other transitional theorists is that institutions can embed path dependence. It is important to appreciate that North's path dependence has broader system-wide application – it is not just a technology path dependence, but a way of life. On receiving his Nobel Prize, North noted as follows:

“Institutions form the incentive structure of a society and the political and economic institutions, in consequence, are the underlying determinant of economic performance. Time as it relates to economic and societal change is the dimension in which the learning process of human beings shape the way institutions evolve.”⁵¹

And so the extent to which a technology is bound to follow a path dependence or not is tied to the extent to which an existing institutional framework is protected from radical change. North argues that institutional change usually moves incrementally:

“... because large scale change could harm existing organizations and therefore is stoutly opposed by them. Revolutionary change will only occur in the case of 'gridlock' among competing organizations, which thwarts their ability to capture gains from trade.”⁵²

Stock-of-knowledge change

STOCK-OF-KNOWLEDGE

THE BODY OF ACCUMULATED KNOWLEDGE IN A FIRM OR COUNTRY

This consistency of path dependence is also a result of the fact that the institutional framework (the regime) has encouraged a specific **stock-of-knowledge** and skills to be developed over time and that change requires the accumulation of new skills and stock – this is another reason why change is incremental and path dependent. If we were to gravitate the focus in the direction of micro-enterprises rather than firms, the integrity of the institutional matrix will define not only opportunity but also what is done with that opportunity. The institutional framework sets the pay-off

49 By organisations he means firms, labour unions, the state, political parties, etc.

50 One can see this with Sasol, for instance. Its long-term plan is to exit coal and to substitute coal with gas and yet retain its core business and expertise.

51 See http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1993/north-lecture.html.

52 North, D.C. n.d. Five Propositions about Institutional Change. Available at: <http://econwpa.repec.org/eps/eh/papers/9309/9309001.pdf>.

PIRACY

A FORM OF PREDATORY RENT-SEEKING

Piracy displaces productive appropriation of incentives and opportunities that can support long-run growth.

structure,⁵³ which in turn will influence the relative weighting between predatory or productive use of opportunity. As North notes:

“If the highest rate of return in an economy comes from **piracy** we can expect that organizations will invest in skills and knowledge that make them better pirates. Similarly, if there are high returns to productive activities we will expect organizations to devote resources to investing in skill and knowledge that will increase productivity.”⁵⁴

This is a telling point because if the political system⁵⁵ embodies the institutional framework that encourages ‘piracy’, economic progress is diminished: growing skills, new knowledge and innovation are reduced, as piracy displaces productive appropriation of incentives and opportunities that can support long-run growth. As North notes: “... the stock of knowledge the individuals in society possess is the deep underlying determinant of the performance of economies and societies”.⁵⁶

What exactly those technologies are and how they displace existing ones is left to a variety of economic agents to determine. It is also not as if firms or organisations wait for the right institutional moment to arrive. Sometimes change is a result of organisations engaging the political process to bring about gradual change to the institutions from within or outside of the incumbent system.⁵⁷ Interactions of various agents with the system also involve beliefs and mental constructs of the world. Institutional change is also a process of cognitive shifts, shifts in paradigms or seeing the world differently. It is precisely the mental states of actors that interact with the system that determine the deeper entrenchment of path dependence or its incremental flexibility to accommodate new orientations towards the world. The power of beliefs, in North’s model, should not be underestimated in perpetuating path dependence.⁵⁸

North further points out that organisational innovation sometimes occurs within the existing institutional framework, but sometimes entails changing, incrementally, that institutional framework. Change is not just a product of waiting for an incentive regime to change; changing the incentive regime to support a new transition is an important feature of strategic realignment in which firms engage to create new enabling conditions for the technology wave they are in the throes of riding. It is not that they derive only rents; over time their confidence in the institutional system makes them invest in longitudinal capabilities: they retain learning, skills advancement and new knowledge in the existing system.

53 By this it is meant the opportunity cost of sticking to what you know, as opposed to shifting to something new where the future of success is still uncertain.

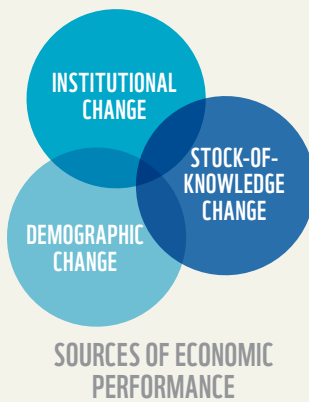
54 North (note 51) p. 3.

55 I mean by this the political system or political economy that governs such a system.

56 North (note 51) p. 3.

57 Oil companies have time and again tried to anticipate the future and embark on lateral strategies to invest outside the oil sector. Exxon has made extensive and pioneering investments in battery technology in the past while BP has invested in renewables. Both abandoned these ventures when oil prices reached very high levels. Shell has reconsidered its position and is taking renewables seriously once again. The tempo of their interventions vary. It all depends on where the world of oil and gas finds itself at a specific point in time.

58 North (note 51) p. 7.



POLITICAL ENTREPRENEURSHIP

A FORM OF
ENTERPRISING
ACTIVITY IN WHICH
POLITICAL INFLUENCE
RATHER THAN SKILL
AND BUSINESS
INNOVATION IS USED
TO SECURE LUCRATIVE
GOVERNMENT
CONTRACTS

PRODUCTIVE ENTREPRENEURSHIP

SKILLED INDIVIDUALS
OR COMPANIES SEEKING
TO USE NATURAL OR
OTHER FORMS OF
CAPITAL TO CREATE
NEW BUSINESS
OPPORTUNITIES
BY PRODUCING
PRODUCTIVE ASSETS,
GOODS OR SERVICES
FOR SOCIETY

North continues:

“... the perception that there is a high-pay-off to investment in skills and knowledge that make the individual, organization and economy more productive will result in long-run economic growth.”⁵⁹

Sometimes the innovation involves a change in the formal institutional structure, which entails specifying the structure of the political system. Therefore a theory of institutional change must embody a theory of the political process as an integral part since it is the political system that specifies and enforces the formal economic rules. Sometimes institutional change involves a (usually gradual) change in informal norms of exchange.⁶⁰ The type of economic performance approach that North suggests is to take a long view in which different elements of economic understanding are melded together such as institutional, demographic and stock-of-knowledge change. He notes:

“We have only begun to explore the interaction between these three sources of economic performance but I believe we can go far in developing useful models of the interaction between them not only in terms of institutions providing the incentive structure for demographic and technological change but also in terms of the way in which demographic- and-stock-of-knowledge-perceived ‘imperatives’ have in turn shaped the change in institutions.”⁶¹

Rent-seeking

This is the core of North’s institutional analysis⁶² in a broader sense of the word than traditional economists would use. The rent model suggests that rent-seeking is an inevitable aspect of a capitalist economy given that market participants are self-interested and seeking the most optimal outcome for their effort, i.e. the highest profit. However, society wants market participants to operate within rules and in a way that their self-interest is not exploitative and garnering more than the share of rents from a particular economic system so as to undermine fairness, productivity and overall economic performance.

Essentially, rent-seeking is confronted with two types of entrepreneurship⁶³ – **political**⁶⁴ and **productive entrepreneurship**. This distinction is important in that it shapes the nature of a country’s political economy and the relationship between market actors and the state. Political entrepreneurs engage in economic

59 North (note 51) p. 3. In societies with high inequality, heterogeneity and contested power, the achievement of cooperation is critical for long-run growth because a precondition for long-run growth is institutional stability.

60 North (note 51) p. 3.

61 North (note 51) p. 9.

62 North, D.C. 1971. Institutional change and economic growth. *The Journal of Economic History*, 31(1):118–125, p. 121.

63 The economist Thorstein Veblen, for instance, distinguishes the pioneering and adventurous captain of industry from the one who has access to finance or has inherited capital him-/herself and is seeking stable and steady returns. The industrial entrepreneur seeks to make something out of technology; the financier seeks the best bets on the technology and the ones that offer the best returns.

64 The term ‘political entrepreneurship’ is used for people who have political influence because they are politicians, senior government officials or members of a dominant political party. In the case of South Africa, Black Economic Empowerment (BEE) enabled a variety of political entrepreneurs to emerge. These vary from genuine black entrepreneurship to the use of colour and political access as a way to secure shares, holdings or forms of ownership jointly with white or foreign enterprises as BEE requirements are essential to doing business with the government. Not meeting the required thresholds means those seeking government contracts do not qualify to do the work. Not all BEE is corrupt, but neither is all BEE free of corruption and scheming as a way of rent-seeking with little effort.

activity if they can use political influence to gain preferential access to and influence the allocation of state resources in their direction. Productive entrepreneurs are generally outside the political sphere of influence and rely on their skills, capital and entrepreneurship to secure rents from public or private contracts. It is also possible for political and productive entrepreneurs to form alliances or working relations, especially if lucrative state contracts are involved. The one garners access to the state, whereas the other complements this access with the necessary competencies to deliver the outcome. The distinction does not suggest that productive entrepreneurs are nobler than political entrepreneurs as both can be predatory in nature.⁶⁵

The design of public procurement can have a significant influence on how political and productive entrepreneurship interact to secure rents in the provision of public goods. As an example:

After four rounds of Renewable Energy Independent Power Producer Programme (REIPPP) bids, renewable technologies have entrenched themselves in South Africa's energy mix as one of the strong contenders for a low-carbon solution because the REIPPP has demonstrated cost reductions and that projects have had no known cost overruns.⁶⁶ Given our earlier mention of the dynamics between political and productive entrepreneurship, the combination of both were necessary to ensure the right mix of ownership between domestic and foreign ownership of Independent Power Producers (IPPs).

The ability of political entrepreneurs to overtly influence outcomes was curtailed by the fact that the REIPPP procurement process was run by an independent institution, the IPP Office, and the bidding process was rigorous and transparent. In effect, the state has left IPP productive entrepreneurs to resolve between themselves and political entrepreneurs the degree of rents they can extract from IPP deals. The IPP Office in its power-purchase agreement contracts was focused on three outcomes: price performance, broadening of ownership and socio-economic development. The same cannot be said to be true for other types of infrastructure developments. Furthermore, there is a danger that the REIPPP is likely to be curtailed and displaced by the fact that the South African government wants to engage in a large nuclear build programme.⁶⁷

65 Baumol, W.J. 1990. Entrepreneurship: Productive, unproductive, and destructive. *Journal of Business Venturing*, 11:3–22. Note what Baumol says in the concluding section of his paper (p. 20): "... the rules of the game that specify the relative payoffs to different entrepreneurial activities play a key role in determining whether entrepreneurship will be allocated in productive or unproductive directions and that this can significantly affect the vigor of the economy's productive growth."

66 Eberhard, A., Kolker, J. & Leighland, J. 2014. South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons, World Bank Group. Available at: <http://www.gsb.uct.ac.za/files/ppiafreport.pdf>.

67 Reference is being made to corruption scandals rocking the only electricity utility in South Africa, Eskom. Allegations pertain to the building of the two new coal-powered plants, Medupi and Kusile. The South African government's push to go nuclear is largely seen as a way to gain access to new sources of rents and given that much of the nuclear deal will be conducted in secrecy, it is already a subject of intense lobbying and political entrepreneurship. The REIPPP programme, because of its rigour and independence from political influence, was largely successful in reducing rent-seeking from political entrepreneurs unless they had something to offer. Observers, like the author, can only surmise that the current attempts to curtail and shut down the successful REIPPP has to do with the fact that it reduced unproductive rent-seeking by political entrepreneurs.

Nonetheless, the REIPPP has also raised the problem of the rapid deployment and scaling of new clean technologies without managing impacts on the existing energy system.⁶⁸ By this is meant that grid capacity and stability are essential for the increased installation of intermittent technologies like renewables. After a certain point, systems back up and stability costs will increase. This has been used by opponents of renewables to argue for baseload power solutions rather than renewables. The REIPPP has also come up against the coal lobby – essentially coal-sector workers and transporters – who say that the REIPPP is reducing the demand for coal and that renewables are responsible for job losses in coal mining and the haulage of coal.⁶⁹

Political entrepreneurs try to extract as much as possible without being subject to performance outcomes.

The dominance of political entrepreneurship suggests that the use of political influence is to secure rents without the need for demonstrable productive outcomes. This undermines economic progress and redistribution. Political entrepreneurship⁷⁰ can displace productive entrepreneurship and evolve into a predatory relationship between market actors and the state. In a sense they see it as their task to extract as much as possible without being subject to performance outcomes. They may even create a layer between themselves and productive entrepreneurs by first rewarding themselves with rents before the productive entrepreneurs are able to produce and reward themselves with profit. In a sense, the political entrepreneurs are the first to skim off the surplus before the productive entrepreneurs can set their own profit target. The effect of political entrepreneurship on institutions is to generally weaken governance. It follows that, without strong governance, state procurement and productive use of state resources will not be attained. Gresham's Law prevails: bad money follows bad money and drives out the good.

Furthermore, it is important to differentiate – conceptually – between the productive use of rents versus the predatory use of rents and the undermining of economic advancement. State allocation and investment create new market opportunities that are vulnerable to political entrepreneurship. In addition, political entrepreneurship and rent-seeking are more prevalent where productive entrepreneurs seek lucrative opportunities from state purchases of goods and services.

Markets existing outside of state spend rely on rules to curtail the excessive pursuit of profits by productive entrepreneurs, and prevent the creation of monopolies and the gaining of market advantage over consumers. This is not to suggest that 'privateering' in the private market does not take place: well-established firms can seek to maximise profits through ensuring legislative reforms that create barriers by pushing up the cost of entry for competitors, or they may simply exploit tax havens and tax-avoidance schemes to pay less in high-tax jurisdictions while maximising income in low-tax jurisdictions. To achieve favourable market conditions, productive

68 It illustrates the point that, given that incumbent systems rely on existing energy carriers, which is coal in the case of South Africa, displacing coal with renewables will entail job losses in the coal sector. These long-term effects have to be managed sensitively given the continued importance of coal for jobs in the mining sector and export earnings.

69 See <http://ewn.co.za/2017/06/27/nuclear-and-coal-lobbies-threaten-to-scupper-renewables-in-south-africa>.

70 See McCaffrey, M. & Salerno, J.T. 2011. A Theory of Political Entrepreneurship. *Modern Economy*, 2(4):552–560.

entrepreneurs themselves will deploy political entrepreneurs or political avenues to secure, what the World Trade Organization calls ‘most favoured status’, within the firm’s country of origin and in foreign markets. This is a classic case of where politics works for firms rather than firms being ruled by the political system.

Khan on curtailing piracy in emerging economies

Governments should work on how to turn rent-seeking behaviour into productive outcomes, so as to achieve tangible progress in development.

Khan, whose insights are largely drawn from experience in the adoption of new technology and industrial initiatives in developing countries, provides some insight on how predatory behaviour could be curtailed in emerging economies like South Africa. He argues that the productive use of rents is an outcome of ‘political settlement’⁷¹ and that ‘good governance’ is not a prerequisite for growth. In fact, good governance⁷² is often a product of growth. He is also of the view that to focus first on cleaning up corruption and rent-seeking behaviour as preconditions for development is naïve. Governments should rather work on how best to reduce this behaviour and turn rent-seeking into productive outcomes so that progress in development becomes tangible.⁷³

Khan’s model is more applicable to dysfunctional states and governance systems that are perhaps prone to a greater incidence of ‘piracy’ than the emergence of productive entrepreneurship. His model complements North’s insights and is more applicable to conditions faced by many emerging economies. Khan points out that the challenge is not to place emphasis on getting the institutional framework right, but to rather solve North’s ‘piracy’ problem while the institutional system remains a work-in-progress. In other words, good governance is evolving rather than waiting for political settlement before real things in the economy can happen. Khan sees political settlement as:

“... shorthand for describing the distribution of bargaining power and technical capabilities across the relevant organizations in that society. A specific technology policy generates rents across different organizations and requires these rents to be allocated and managed in particular ways to achieve the desired outcomes.”⁷⁴

“The political settlement is relevant for understanding the likely outcomes of the policy because it describes the capability of organizations to challenge or distort the conditions of rent allocation implicit in the formal policy.”⁷⁵

Khan’s main insight is the suggestion that rent-seeking is tolerable in society if it can deliver tangible outcomes. His views are relevant as they have bearing on technology strategies linked to developmental and industrial policy outcomes.⁷⁶

71 Khan, M. 2013. Political settlements and the design of technology policy. In J. Stiglitz, J.Y. Lin & E. Patel (eds). *The Industrial Policy Revolution II. Africa in the 21st Century*. London: Palgrave. Available at <http://eprints.soas.ac.uk/17297/1/Political%20Settlements%20and%20Technology%20Policy.pdf>.

72 Khan, M. 2012. Governance and growth: history, ideology and methods of proof. In A. Noman, K. Botchwey, H. Stein & J. Stiglitz (eds). *Good Growth and Governance in Africa: Rethinking Development Strategies*. Oxford: Oxford University Press, pp. 51–79.

73 Khan, M. 2013. Technology policies and learning with imperfect governance. In J. Stiglitz & J.Y. Lin (eds). *The Industrial Policy Revolution I. The Role of Government Beyond Ideology*. London: Palgrave, pp. 79–115.

74 Khan (note 70) p1.

75 Khan (note 70) p. 25

76 Khan (note 70) p. 2.

The political settlement can work in both positive and negative ways, depending on the 'holding power' of organised groups. It can work in positive ways if the right incentives and governance are exercised over performance in exchange for rents.

The political settlement concept seeks to characterise the mode of rent capture that can be a result of two processes:

1. Every effort in politically well-connected firms or individuals to use political influence to seek rents, irrespective of the productive outcomes
2. Firms that are pushed in the direction of ensuring productive outcomes and will only do so if various forces in society are able to impose checks and balances over excessive rent-seeking by these firms.⁷⁷

Khan's insights are useful to thinking through⁷⁸ how industrial strategy can produce development outcomes without turning industrial policy into an instrument in which rent-seeking opportunities are expanded, thus inviting political entrepreneurship rather than productive entrepreneurship. As Khan notes, the reason why some countries have ensured high-productivity industries has little to do with infrastructure investments and education. Rather, it has to do with being able to sustain learning over time, with the right enabling conditions fostering such long-term learning and reinvestment in productivity.

Khan's observations are aligned with North's contention that the key to improving learning and the stock-of-knowledge is attributed to the institutional structure. If the institutional structure fosters the predominance of piracy, little long-term learning, productivity or economic progress can be attained. If a country imports foreign technology, early marginal costs are higher than the advanced country's marginal costs and these costs are only reduced over time through learning-by-doing when the importing country adopts the new technology.⁷⁹ It is also important that the adopting country links the use of the new technology to improved economic productivity and fosters localisation of the technology once it is scaled up. Countries that have good rent management systems succeed more often in achieving productivity goals than those countries with weak rent management systems, which make them prone to capture by predatory rent seekers.

Countries that have good rent management systems succeed more often in achieving productivity goals than those countries with weak rent management systems.

⁷⁷ Khan (note 70) p. 22–23.

⁷⁸ Khan, M. 2004. Strategies for state-led social transformation: rent management, technology acquisition and long-term growth. Presented at Asia Development Bank (ADB), Workshop on Making Markets Work Better for the Poor, Hanoi, Vietnam 12–15 April 2004.

⁷⁹ Khan proposes that the only way to foster learning is to have a short-run subsidy that is removed as learning rates and productivity improves. Otherwise, these subsidies merely become dead-end rents and keep alive loss-making industries or technologies. The administration of subsidies requires states to have monitoring and enforcement capabilities. Crucially, they need to have the means to judge productivity gains.

Easy rents are a product of institutional distortions in which poor political oversight, weak bureaucracies and corruption encourage political entrepreneurs.

Torvik on the effects of easy rents in resource-rich countries

Torvik's⁸⁰ work, which is primarily drawn from experiences in resource-abundant countries, adds nuance to the insights that Khan and North have already established. His model also throws more light on how the relationship between political and productive entrepreneurship evolves in resource-rich countries. Torvik's core thesis is that discoveries of new natural resources or the opening of new economic sectors can direct political reform that either entrenches or breaks up existing privileges.⁸¹ Torvik emphasises that easy rents tend to drive political entrepreneurship towards activities that are likely to be sustained over long periods. Easy rents are a product of institutional distortions in which poor political oversight, weak bureaucracies and corruption encourage political entrepreneurs. Political entrepreneurship in turn creates disincentives for productive entrepreneurs in engaging productive pursuits if productive entrepreneurs find that the rewards for their efforts result in rents being diverted away from the productive side of the economy to the rent-seeking part. Torvik's theoretical framing demonstrates, first, the diminishing returns for productivity from political entrepreneurship and, secondly, that the increase in political entrepreneurship that directs state resources to more rent-seeking, weakens the incentive for productive entrepreneurship.⁸² He notes:

“A higher number of entrepreneurs in productive activity gives higher production, income and thus greater demand. Greater demand in turn increases sales and profitability. A higher number of entrepreneurs in productive activity gives higher tax income, greater public income, and thus better services and infrastructure. Good public services and infrastructure in turn increase the profitability of private industrial activity.”⁸³

Changes in the political economy is a prerequisite for an inclusive low-carbon economy to prevail.

Even in state-led or state-controlled economies, state institutions may seek a monopoly over economic rents through nationalised firms or the nationalisation of key resources. The formation of state-controlled and state-informed markets does not in itself suggest that state accumulation strategies benefit the public or improve redistribution of income. State strategies of control over market share could well serve political elites and well-connected bureaucrats who want to remain in power. The state's control over the economy depends on how much the state is willing to forego components of capital accumulation to foreign firms and private firms of domestic origin. The incumbent regime may take a view that total ceding of the economy to foreign and national firms may lead to giving up too much economic power so that they will grow distant to the state and incumbent political power. Incumbent regimes will always seek to find a balance between how much they are willing to give up to the private market (foreign or domestic) and how much of that can be reciprocated in ways that allow the regime to stay in power.⁸⁴

80 Torvik, R. 2010. The Political Economy of Reform in Resource Rich Countries. The article was drawn from a lecture at a high-level seminar on 'Natural Resources, Finance and Development: Confronting old and new challenges', organised by the Central Bank of Algeria and the IMF Institute in Algiers, 4–5 November 2010.

81 Mehlum, H., Moene, K. & Torvik, R. 2012. Mineral Rents and Social Development in Norway. In K. Hujo (ed). *Mineral Rents and the Financing of Social Policy*. UNRISD.

82 Here, consideration should also be given to the fact that productivity from rent-seeking is reduced as the sector tends to attract other political entrepreneurs who have a similar intention. The overall income distribution is reduced and in such a climate corruption and crime tend to be exacerbated, further increasing costs and reducing income.

83 Mehlum, et al. (note 80) p. 6.

84 See Mickelthwait, J. & Wooldridge, A. 2015. *The Fourth Revolution: The Global Race to Reinvent the State*. Westminster: Penguin Books.

A transition realism theory to support low-carbon interventions

As political and economic literature would show, changes in the political economy is a prerequisite for an inclusive low-carbon economy to prevail. As already pointed out, the same rent-seeking behaviour will continue from old to new regimes, thus creating path dependence.⁸⁵ Even in a low-carbon economy with free movement of money between different economic agents – where capital is concentrated in the hands of a few – money easily moves from sectors with declining returns to new sectors with better returns.

Interventions:

→ *Generalised policies to optimise use of new technologies.*

→ *Technology options that minimise costs and improve profits or savings.*

→ *Incentives offered to new technologies.*

There is of course always the danger that the overall share of rents between old and new economies will be cornered by the same political and economic forces that dominate the resources sector, new infrastructure or technology spend.⁸⁶ Political entrepreneurs in or without the collaboration of productive entrepreneurs can simply diversify their stakes in new sectors that are opened up. Nothing changes as the same players simply use their power of money and political influence to extend their reach.

Given that transitions are an outcome of multilayered processes, it is useful at this point to touch again briefly on interventions that may support low-carbon projects.

- Generalised policies such as a carbon pricing, reflected directly and indirectly, will influence firm and household decisions to optimise their behaviour or switch to better fuels or energy-saving technologies.
- Technology options that enhance productivity and competitiveness in the market are more likely to be adopted by firms or households if these minimise cost and improve profits (in the case of firms) or improve savings (in the case of households).
- Firms invest in particular technology options and production methods because the institutional structure incentivises these choices by offering the firms high pay-offs. Once path dependence is created in an economy it is perpetuated because of the nature of the capital investments made in response to the pay-off system. These investments tend to be long-term in nature. The ability of firms to switch to low-carbon technologies is dependent on the degree to which they are able to forego the old technologies for new ones if the penalty for doing so is zero or marginal. Those that cannot make the switch because the pay-offs of the old technology regime are still high relative to what the new technologies can offer, will require support or some form of tax relief or other compensation from the state. If there is no incentive to switch, as the pay-off is too low, the general tendency is for firms to continue along the route of path dependence, both in the types of new technologies they adopt (if any) or how they innovate (if at all). For example, firms that have accumulated competency in dealing with fossil-fuel-based technologies will switch to other compatible fossil fuels, like coal-to-gas, or innovate only by optimising the existing system. Only radical technological disruption will jolt firms out of path-dependent systems as these technologies begin to eat at profits and companies find themselves on the path to a strategic crisis.

85 When we refer to rents we mean in the broader sense – not only monetary but also the capture of political and economic institutions that favour an elite or specific group of interests in society. Rents are not necessarily earnings through corrupt means; they could well be perfectly legal forms of public investments yet socially unproductive.

86 Further theoretical perspectives can be gained from a chapter written by Ragnar Torvik titled: 'Political Economy of Reform in Resource-Rich Countries'. See A. Sy, T. Gylfason & R. Arezki (eds). 2011. *Beyond the Curse: Policies to Harness the Power of Natural Resources*. Washington D.C.: IMF. While they apply the rent theory model for the extractive industries, the conceptual frame can also be used for the understanding of rent-seeking in the energy sector.

COULD SELF-INTEREST AND INCENTIVES DRIVE A LOW-CARBON TRANSITION IN SOUTH AFRICA?

Transition theorists generally provide broad and abstract descriptors of techno-economic transitions because they are focused on drivers that shift the adoption of new technologies to displace the old.

These drivers tend to be generalised macro-level abstractions. The conventional transition theories developed by transition theorists from sustainability backgrounds need to be complemented and deepened with insights from economic theorists.

The flow of rents and how the rents are structured in terms of enforcing productive outcomes will ultimately determine whether entrepreneurship is 'piracy' or productive entrepreneurship.

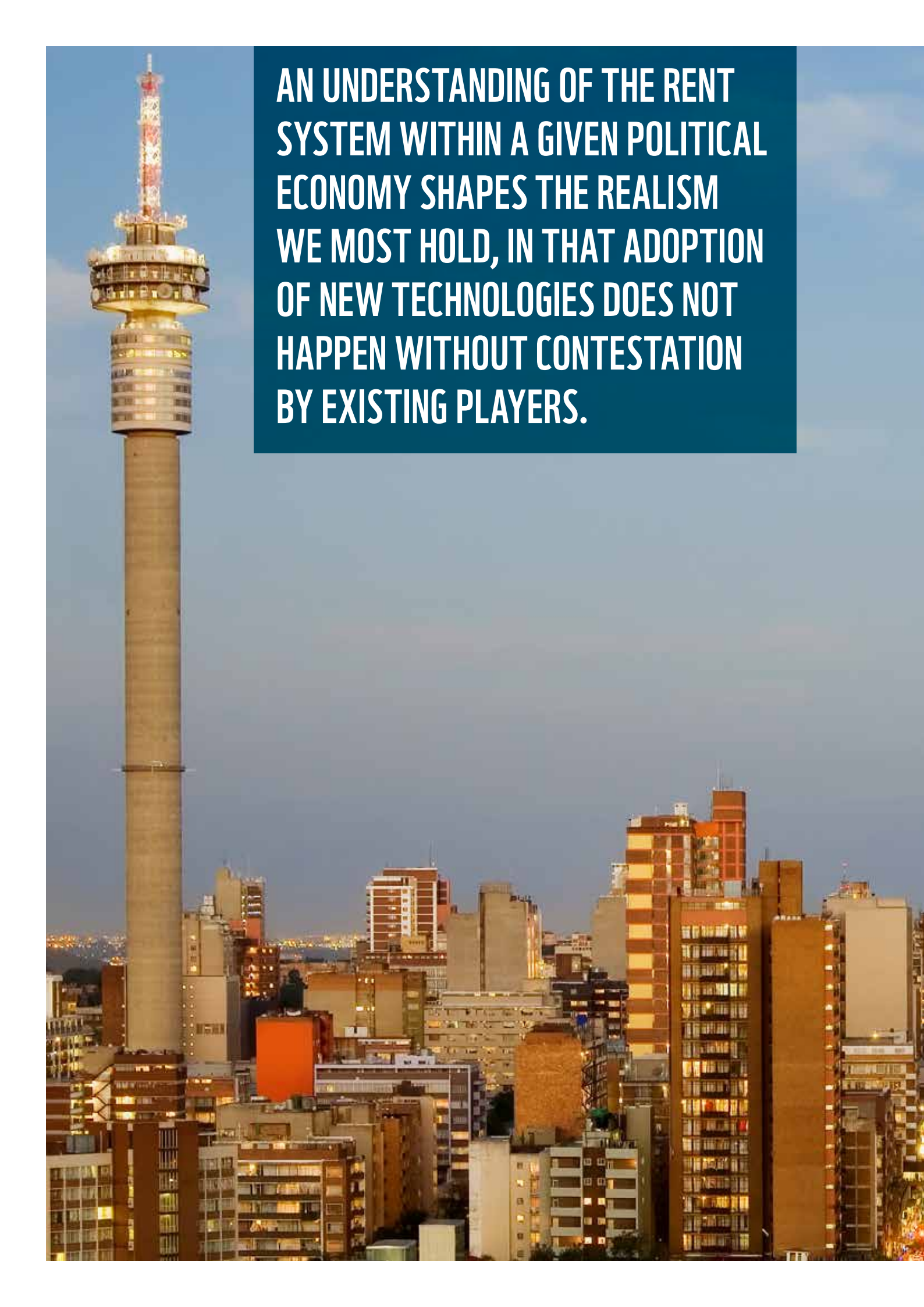
This paper is an attempt to propose a transition realism model that relies on self-interest and incentive-based agency as the main drivers of transitions. Rent theories suggest that long-term plans and visions for transitions to low-carbon technologies are dependent on the strength of political governance. The flow of rents and how the rents are structured in terms of enforcing productive outcomes will ultimately determine whether entrepreneurship is 'piracy' or productive entrepreneurship. The paper posits that this way of thinking is better aligned to emerging-market conditions and will bring realism to how low-carbon transitions should and can be managed in these countries.

Critical to this paper are North's observations on path dependence. He points out that path dependence is an outcome of institutional structure and the way rents are allocated, and that it relies on the beliefs of actors that determine the technology options and choices they will opt for. Path dependence slows down the process of change, unless the institutional structure is radically able to shift the incentive scheme. This suggests that the grip of path dependence, as articulated by North, makes low-carbon transitions more of an economic issue than not, as change is only facilitated as the outcome of rent capture. The extent to which political entrepreneurship supersedes productive entrepreneurship in the exploitation of rents, which incentivises the adoption of new technology, displaces the long-run productivity, learning, capabilities and knowledge that productive entrepreneurs can entrench in a transition process.

Political entrepreneurship can influence the pace and scale of low-carbon transitions negatively and undermine the long-term benefits from these transitions.

What we can affirm with this theoretical framework is that, without a ‘political-settlement’, as Khan calls it, a transition from coal to low-carbon technologies in South Africa will be neither automatic nor guaranteed to be inclusive, in that economic activity and benefits generated from these new technology interventions are not equitable and do not address poverty. Institutions tend to be resilient in retaining the core system of political economy and so also in the distribution of rents. The theoretical framework also suggests, as Torvik points out, that the introduction of new technologies can disrupt and readjust the old system because new technologies require a change in the system and tend to be championed by a new set of entrepreneurs.

The theoretical framework being proposed suggests that an understanding of the rent system within a given political economy shapes the realism we most hold, in that adoption of new technologies does not happen without contestation by existing players. Technology transitions may be a better predictor of transition outcomes with regard to firm choices, systemic transformation of the energy system and the scale and rate of adoption of low-carbon technologies. It is suggested that, unlike other transition frameworks dominant within the sustainability community, this framework moves from a theoretical and aesthetic description of transitions to a more nuanced and complex process determined by each country’s own unique political economy and system of path dependence.



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TRANSITION REALISM

explores implications of rent-seeking behaviour to achieving South Africa's low-carbon technology ambition

10 TONNES OF CO₂

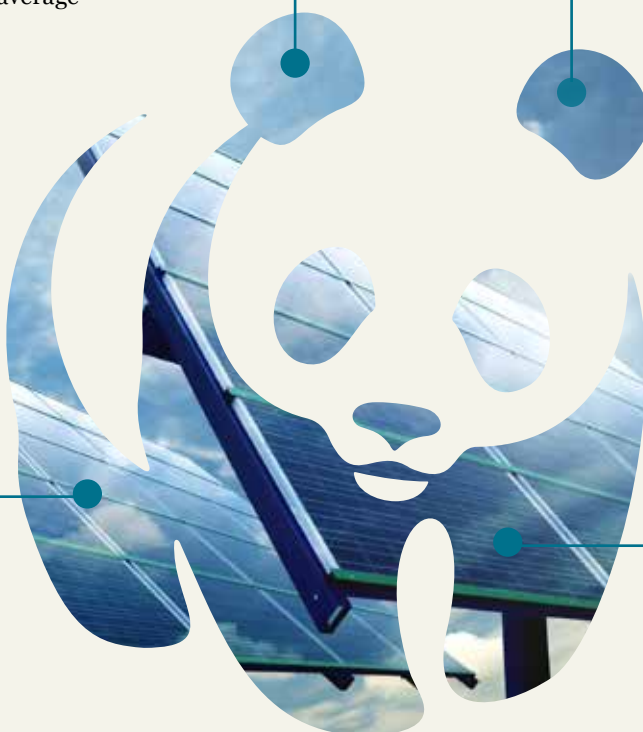
The average CO₂ emissions per capita in South Africa which exceeds the global average

TRANSITION THEORY

provides insights into how a low-carbon transition could evolve

SOUTH AFRICA'S COMMITMENT

to plateau its carbon emissions between 2025 and 2035, and to reduce them thereafter



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