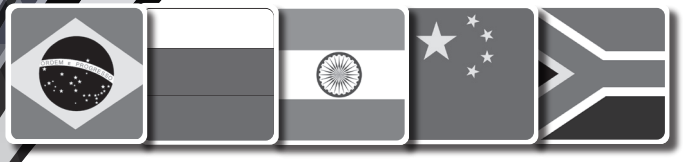
TOWARDS A LONG-TERM STRATEGY FOR BRICS

A proposal by the BRICS Think Tanks Council



TOWARDS A LONG-TERM STRATEGY FOR BRICS

A proposal by the BRICS Think Tanks Council

2015

CONTENTS

PRESENTATION

In 2014 Brazil held the *pro tempore* presidency of BRICS. This means that Brazil also coordinated the meetings and work of all the groups created at previous BRICS summits during that year.

The BRICS Think Tank Council (BTTC) was no exception. Created in 2013, it held its third meeting in March 2014, in Rio de Janeiro. Ipea is the official Brazilian representative at the BTTC; therefore, its staff was responsible for organising and coordinating that BTTC meeting, as well as the VI BRICS Academic Forum.

At its meeting in Rio de Janeiro the BTTC members agreed to prepare a document dealing with a long-term strategy for the five countries. This document was later recommended by the BRICS leaders at their sixth summit, held in Fortaleza in July 2014.

It has, therefore, fallen to Ipea to coordinate the work to prepare this document. It is the result of a year of collaboration by the Think Tanks of the five countries and focuses on five pillars. It presents a diagnosis of the current situation with regard to these pillars and a set of recommendations to BRICS in each case.

It is expected that this important document will contribute to the definition of joint initiatives by the five countries, with the aim of improving their processes of social and economic development, as well as to joint action by the five countries in pursuit of their objective of achieving a better international order.

Jessé Souza
President of the Institute for Applied Economic Research

FOREWORD

It is understood by the BRICS Think Tanks Council (BTTC) members that the BRICS countries share common ideals in the pursuit of economic and social development. Reaching the corresponding goals will be facilitated by joint initiatives of the five countries, sharing experiences and information, as well as improving the conditions to foster intra-group trade and investment flows. At the same time, the BRICS members are committed to making joint efforts to build a more just and fair international order. This set of objectives imposes the need to build a rather wide-ranging common agenda in the medium to long run. This is the focus of the present document, jointly elaborated by the five think tanks.

At its third meeting, in March 2014, the BTTC approved a document entitled *Towards a Long-Term Strategy for BRICS – Recommendations by the BRICS Think Tanks Council*, which was submitted to the BRICS leaders at their sixth summit. According to Article 66 of the Declaration following that summit, "The BTTC is encouraged to develop strategic pathways and action plans that will lead to the realization of this long-term strategy".

The BTTC presents here the diagnosis of the current situation and then proposes a set of recommendations with regard to the five pillars selected in the above-mentioned document, namely: *i*) promoting cooperation for economic growth and development; *ii*) peace and security; *iii*) social justice, sustainable development and quality of life; *iv*) political and economic governance; and *v*) achieving progress by sharing knowledge and innovation.

Each of these issues was developed by a working group formed by members of the five countries. Each group was coordinated by the think tank of one of the BRICS countries. China coordinated the preparation of topic 1, Russia topic 2, South Africa topic 3, India topic 4, and Brazil chaired the preparation of topic 5 and coordinated the whole process.

These working groups comprised technical staff from the five governments, as well as experts from civil society in each country. It is understood, therefore, that the present set of diagnosis and recommendations corresponds to a broad view shared by various members of society in the five countries.

The document will be submitted to the Heads of State at their seventh summit, in Russia in 2015, and it is expected that it will contribute in a substantive way to the identification of lines of action to be jointly adopted by BRICS.

A work of this magnitude necessarily requires the efforts of several people. Group 1 was coordinated by Zhou Yuyun, and had as formal active members Claudio Amitrano (Brazil), Elena Rogathykh (Russia), Zhao Zhongxiu, Sun Jingying (China), Vivan Sharan (India) and Jaya Josie (South Africa).

Group 2 was jointly coordinated by Georgy Toloraya and Victoria Panova, and the formal members were Edison Benedito and Paulo Esteves (Brazil), Nandan Unnikrishnan (India), Zhao Zhongxiu (China), and Narnia Bohler-Muller and Candice Moore (South Africa).

Group 3 was jointly coordinated by Olive Shisana and Narnia Bohler-Muller, and the formal members were Maria Paula Santos (Brazil), Leonid Grigoriev (Russia), Rumi Aijaz (India), Sun Jingying (China) and John Luiz, Edward Webster, Jackie Dugard and Michelle Pressend (South Africa).

Group 4 was jointly coordinated by Samir Saran and Vivan Sharan, and the formal members were Carlos Lampert Costa and Ivan Oliveira (Brazil), Victoria Panova (Russia), Lan Qingxin (China), Jochen Mistelbacher (India) and Temba Masilela and Siphamandla Zondi (South Africa).

Group 5 was coordinated by Luis Kubota, and the formal members were Marnia Larionova (Russia), Jochen Mistelbacher (India) and Glenda Kruss and Rasigan Maharajh (South Africa).

The consolidated version of the document was prepared with the support of Tamara Farias, Andre Pineli and Luisa Nazareno, from Ipea.

This first joint activity by the BTTC is expected to be considered an example of the type of contribution that the group of think-tanks can provide in terms of analysis and proposals to BRICS.

Renato Baumann
2014 Coordinator of the BRICS Think Tanks Council (BTTC)

EXECUTIVE SUMMARY

In the past few decades the BRICS countries (Brazil, Russia, India, China and South Africa) have played a vital role in the world economy in terms of total production, investment capital destination and as potential consumer markets. BRICS economic growth and social inclusion policies have helped to stabilise the global economy, foster job creation, reduce poverty and combat inequality, thus contributing to the achievement of the Millennium Development Goals (MDGs).

The global economy has been showing signs of a recovery following the financial crisis. While it is likely that global gross domestic product (GDP) will increase, the pace of growth itself is uncertain. Additionally, the quality of growth is far from certain, with real economic data not showing significant improvement. Instead, the meagre growth achieved so far, especially in advanced economies, can be attributed to attempts at demand augmentation via a reduction in fiscal tightening as well as liquidity-boosting measures via extremely accommodative monetary policies.

Advanced economies' central banks are struggling to mitigate deflationary trends and have not yet been able to commit to a definite timeline on withdrawing liquidity support. Although the active monetary policies have mitigated the immediate adverse effects of the crisis, and have had a positive impact on unemployment, they have not had a commensurate effect on investment growth. All of this points to a danger of secular stagnation – a permanently lower trend of growth.

With this prospect, the BRICS countries should come up with proactive policies that reinvigorate their domestic economies, establish stronger economic relationships among themselves and influence the international scenario. This will also help them to reduce to some extent their excessive dependence on exports to markets in developed countries.

In view of this situation and aiming at making suggestions for joint BRICS initiatives from a long-term perspective, the BRICS Think Tank Council (BTTC) has focused on five dimensions, namely: the promotion of cooperation for economic growth and development; the maintenance of peace and security; social justice, sustainable development and quality of life; political and economic governance; and achieving progress by sharing knowledge and innovation. This document presents the BTTC appraisal of the overall scenario with regard to these dimensions, indicates some challenges and proposes a set of recommendations to deal with them.

In terms of economic cooperation and growth, BRICS countries should fully participate in the formulation of international financial standards and rules, make the best use of international financial reforming achievements and implement international standards to achieve internal reforms and to improve their own robust financial standards.

To be able to achieve these goals, BRICS countries consider two conditions fundamental: reform of the governance of multilateral institutions, and the establishment of international peace and security.

BRICS countries shall continue their efforts to promote changes in the voting rights at the IMF and the World Bank. They must also insist on the reform of the United Nations, including the Security Council. These measures are needed to reflect the new economic power of emerging economies.

In parallel to these adjustments in the economic realm, the aim of BRICS is to create a better and safer world order through peaceful diplomacy and multilateralism. Peace and stability can be achieved through cooperation and collaboration around existing national, regional and international peace and security initiatives, and by developing new strategies and mechanisms to ensure a secure future, as the UN Charter suggests.

Despite all the efforts made by the international community, it has not yet succeeded in elaborating an adequate strategy to oppose local and regional threats, as a number of recent events demonstrate. For example, a number of new elements add up to affect security. Emerging types of offensive weapons pose a danger to global stability; they are not covered by any particular treaty, they may disrupt the established balance of power, and their usage could lead to conflict. Furthermore, terrorism is condemned in all its forms and manifestations. All five BRICS countries express grave concerns over the fact that terrorists increasingly use globalisation processes to promote their cause and inflict greater damage on peoples of the world.

Another example is the drug problem, which has evolved into a truly global phenomenon, with transnational drug crime becoming one of the leading illegal activities in the world.

It should also be added that the BRICS countries remain under-represented in the field of global internet and cyber governance. BRICS should, therefore, increase the common areas of cooperation to deal with these issues in accordance with their agreed principles.

From their national perspective, while the BRICS countries have managed to sustain considerable economic growth over the past decades, they continue to face significant challenges in ensuring social and economic justice at national and

regional levels. The presence of high rates of inequality is a common challenge faced by all BRICS countries. Like many emerging markets and developing countries, they continue to experience high levels of poverty, inequality and unemployment that undermine the rights of citizens to social justice and a better quality of life.

The BRICS countries have decided to expand their focus to social development issues. A key step is the formal commitment to strengthen their cooperation in education. The MDGs have only partially been achieved.

The goal of universal health coverage among BRICS countries aims to ensure that citizens have health coverage in a publicly financed health system. Different situations are found in the BRICS countries, and cooperation and sharing experience certainly contribute to achieving such goals. Health coverage is also affected by the pace of immigration.

Migration is an increasingly important issue for all BRICS countries, indicating the existence of a number of common problems and policy goals. High rates of population growth and urbanisation – which also include migration – have not only affected the provision of public services such as health and education but also mean that the provision of affordable housing is a growing problem.

Furthermore, as emerging economies with large populations, land masses and disparities among their people, the BRICS countries stand to be significantly impacted by climate change. Their particular vulnerability thus requires them to actively participate in the negotiations and planning underway within their regions and internationally to promote sustainable development.

One basic condition for BRICS to assure sustainable development is to improve competitiveness. This can be achieved through a number of specific initiatives. One of the most important is to provide the conditions for these economies to catch up with developed countries in terms of technical progress.

There is a consensus that scientific and technological developments are positively associated with growing productivity. The question remains as to how to improve in this area. Countries that excel in technology have efficient National Innovation Systems (NISs). These systems represent a set of institutions involved in the creation of science, technology and innovation – notably government, universities and research institutes, and private companies – and the knowledge that flows between them. In a mature NIS, there is a smooth flow of knowledge, with highly innovative firms – competitive in global markets – generating technologies in their own research laboratories or in partnership with universities and research institutions.

BRICS countries have improved their performance in science, technology and innovation (STI) indicators but still lag far behind when compared to more

developed countries. To catch up in terms of governance, a number of issues have to be addressed. BRICS countries have large populations and territories, complex government structures and different levels of government. This, of course, makes the coordination of STI policies very difficult. It is also hard to coordinate STI policies with other public policies. However, joint initiatives such as the exchange of technology and researchers among BRICS and sharing information about specific experiences are likely to be very helpful in creating favourable conditions for overcoming these difficulties.

These goals, of course, impose on BRICS a number of challenges.

For instance, excess liquidity spill-overs stemming from the advanced countries' monetary policies lead to cross-border banking flows, exchange rate volatility, and overvalued assets in capital-receiving countries. Also, the "rebalancing" of the global economy may lead to slow growth in total global demand and restrict the development space for BRICS.

Furthermore, the rise of trade protectionism and increasingly complex issues faced by foreign investment might affect global resource allocation.

As the BRICS countries assume a pivotal role in the global governance architecture, they have to strive to affect structural changes within existing multilateral institutions, to promote effective governance, inclusiveness and transparency. They must be propositional and share relevant governance experiences with each other to further this central objective.

To be effective, it is imperative for BRICS to articulate a collective voice on issues of global importance. BRICS must take a leadership role in matters of global political and economic governance, by voicing not just their collective concerns but also representing the concerns of other emerging and developing countries.

Emerging and developing economies can coordinate and effectively use the international financial architecture to address common concerns. For instance, although the capital structure and voting rights have been amended at both the World Bank and the IMF, voting power is still skewed towards advanced economies. The Group of 20 (G20) can be a particularly useful platform for dealing with this situation, as well as for mobilising civil society to increase the pressure for reforms.

Indeed, BRICS has recently created the first non-regional post-Bretton Woods multilateral institution, the New Development Bank (NDB), to tackle certain challenges.

Infrastructure financing still remains a significant obstacle to the development of many emerging and developing economies and is a clear priority for the members of BRICS. But it is also clear that the NDB's sustainable-development-linked

financing mandate should focus on reducing inequality, improving inclusion and enhancing social and human development. The NDB could follow a demand-driven approach to financing which would place the onus of identification of viable projects for financing on recipient governments.

On the social side, BRICS countries are encountering a long-term brain drain – through educational emigration and the direct outflow of qualified professionals – leading to both a significant loss of highly qualified professionals and financial losses derived from the cost of their education in the home countries of migrants. Conditions should be created to reverse this trend.

Access to social protection services is a challenge for all BRICS countries due to the physical size of the countries and their populations. Ensuring universal access to social protection requires vast logistical operations for those living in remote areas. Other challenges include banking facilities used as a condition for accessing benefits.

Moreover, encouraging and sustaining effective urban planning and municipal governance are essential and have proved to be a challenge across BRICS. Insufficient funding for infrastructure programmes such as housing and the provision of services such as sanitation and water may challenge sustainability. Prioritisation is, therefore, essential.

The move to adopt cleaner energy sources must be encouraged, for its effects not only on the population's access to energy but also for its sustainability and consequent impact on production processes.

BRICS countries have complex innovation systems, involving numerous institutions, laws, regional levels, policies and programmes. It is a complex task to integrate and coordinate all these dimensions, but it is essential that this integration happens; otherwise a lot of time and human and financial resources may be wasted.

BRICS countries have experienced – to different degrees – impressive improvements in their STI indicators. However, overall innovation activity by enterprises is low compared to developed countries. There is a dilemma of how to seek insertion in a globalised market while capturing a significant share of the value added.

In addition to the above-mentioned issues, the current military-political situation near some of the BRICS countries' borders is fraught with large-scale armed conflicts that directly endanger their security. BRICS should deal with these security problems predominantly by using political and diplomatic measures, as provided by the UN Charter. Member States should take note of initiatives on the non-weaponization of outer space and welcome wide discussion of the topic.

It is paramount to mention the construction of the internet regime. BRICS constitutes one of the most massive and rapidly growing segments of the global internet community, accounting for 38 per cent of the world's internet audience. Yet its participation in the debates over global internet and cyber governance is marginal. Joint initiatives should be adopted to change this scenario.

There is, therefore, no lack of subjects to be incorporated into a common agenda for BRICS, and it is fortunate that its members aim to have a proactive approach in terms of their role both in influencing global governance as well as in fostering partnership and cooperation. The main challenge they face is to avoid too great a widening of the agenda and to maintain focus on the relevant issues.

The BTTC is an important instrument to deal with these difficulties. Among its basic purposes, priority is given to channelling suggestions from civil society, as well as stimulating and coordinating research efforts linked to specific matters of interest to BRICS.

CHAPTER 1

PROMOTING COOPERATION FOR ECONOMIC GROWTH AND DEVELOPMENT

PILLAR

To safeguard the gains BRICS nations have made, they should consider promoting cooperation for growth and development among themselves and through dialogue with other like-minded partners. To this end, BRICS could consider market integration in the areas of trade, foreign investment and capital markets to counteract the effects of negative global trends. In addition, member states could work towards greater BRICS consultation and cooperation in economic and financial bodies such as the World Bank, the World Trade Organization (WTO) and the International Monetary Fund (IMF) and collaborate using existing cooperative frameworks to collectively position themselves by fostering intra-BRICS consensus on substantial issues of mutual agreement.

1 CURRENT SITUATION

At present, these five countries account for over 40 per cent of the world's population and, despite the recent deceleration, Brazil, Russia, India, China and South Africa accounted for 29.5 per cent of global gross domestic product (GDP) (based on purchasing power parity – PPP) in 2013, a figure that is forecast to rise to about one third by the end of the decade (IMF, 2014). The BRICS countries have often been regarded as some of the fastest growing economies and the engines of the global economic recovery, which underscores the changing role of these economies in the world. They were also influential at the G20 in shaping macroeconomic policies in the aftermath of the recent financial crisis. Promoting cooperation for economic growth and development is a long-term strategy of the BRICS countries, which is also reflected in the Fortaleza Declaration.

1.1 Overall scenario

The BRICS countries comprise a huge share of the world's land mass, and as a result own a vast amount of natural resources. Each of the BRICS countries has some unique attributes and thus has great prospects for developing in its own way.

It is widely perceived that over the next few decades the world's largest developing countries, particularly the BRICS, fuelled by their fast economic growth, could become a much more significant force in the world economy.

The inherent strength of the BRICS countries emanates from their strong domestic-demand-driven growth model, in the cases of India and Brazil, and the significant outward linkages of China and Russia. South Africa benefits from its

large resource base and proximity to the untapped growth potential on the African continent. Currently, all BRICS economies have consolidated their positions as the main engines for sustaining the pace of the international economy as it recovers from the recent global economic and financial crisis.

The BRICS nations' economic growth and social inclusion policies have helped to stabilise the global economy, foster the creation of jobs, reduce poverty and combat inequality, thus contributing to the achievement of the Millennium Development Goals (see Chapter 3). BRICS will continue to play a significant role in promoting social development and in contributing to define the international agenda in this area.

The BRICS post-2015 development goals have been in accordance with the post-2015 agenda objectives and policy priorities set by the United Nations (2013). The report *A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development* sets out the post-2015 roadmap of international development, including the goal to eliminate extreme poverty by 2030 and realise sustainable development commitments. This report sets five key objectives for the post-2015 United Nations agenda: from "reducing poverty" to "eliminate extreme poverty", every country should work together; make sustainable development the centrepiece of the growth strategy; carry out economic rebalancing to promote employment and inclusive growth; establish a peaceful, effective, open and accountable system; and build a new global partnership based on cooperation, equality and human rights.

On 6 June 2013, the Leadership Council of the Sustainable Development Solutions Network submitted the *Action Agenda for Sustainable Development* to the UN Secretary-General. It outlines ten sustainable development priorities, covering four main dimensions of sustainable development: economic growth and poverty elimination, social inclusion, environmental sustainability, and good governance (UN Sustainable Development Solutions Network, 2013). Based on the concept of sustainable development, this report defines ten policy priorities in the context of the UN post-2015 agenda: to end extreme poverty including hunger; to promote economic growth and respectable job growth within the planetary boundaries; to ensure effective learning for all children and youth for life and livelihood; to achieve gender equality, social inclusion and human rights for all; to achieve health and well-being at all ages; to improve agriculture productivity and raise rural prosperity; to empower inclusive, productive and resilient cities; to curb human-induced climate changes and ensure use of clean energy for all; to secure biodiversity and ensure good management of water, oceans, forests and natural resources; and to transform governance and technologies for sustainable development (ibid.).

1.2 Economic growth and development of the BRICS countries

Among the BRICS countries, China, followed by India, are the fastest-growing economies in the current decade. Between 1978 and 2009 the Chinese economy grew at an average annual rate of 9.9 per cent, well above the world average for that period. The economic performance of Russia and Brazil also improved significantly after the financial crises of the 1990s. Continued economic reforms and improved macroeconomic fundamentals, along with a buoyant macroeconomic environment, contributed to the growth performance of the BRICS nations over the current decade (IMF, 2011).

These macroeconomic fundamentals are reflected by high savings and investment rates, barring Brazil and South Africa, which still have much room to increase these rates. South Africa's investment rate has increased strongly over the past decade as the government and other public enterprises have stepped up efforts in infrastructure investment, but overall investment is still constrained by the low national savings rate.

TABLE 1
Gross domestic investment and savings in BRICS
(In % of GDP)

Country		1995	2000	2006	2010
Brazil	Investment	18.0	18.3	16.8	19.3
	Saving	16.5	16.5	19.7	17.0
Russia	Investment	25.4	18.7	21.4	19.8
	Saving	28.8	38.7	34.1	24.7
India	Investment	26.6	24.2	36	37.9
	Saving	25.4	23.2	32.9	34.7
China	Investment	41.9	35.1	43.6	48.8
	Saving	44.1	37.5	51.3	54.0
South Africa	Investment	18.2	15.9	19.7	21.7
	Saving	16.5	15.8	14.4	20.0

Source: World Bank database.

China has the highest savings and investment rates of the BRICS countries, followed by India. Their investment-driven growth model was largely financed by domestic savings. High savings and investments have also helped to reduce the share of net exports to GDP in these two countries.

The salient features of the BRICS economies are their large geographical area and the size of their population. It is widely perceived that all the BRICS markets have great potential for establishing a prosperous middle class, which serves as a stabilising force in society. This middle-income group in each country is growing

at varying rates, but the direction is clear: the middle-class population will continue to expand in several BRICS countries in both size and disposable income, providing a solid base for further growth.

The collective strength of the BRICS economies is becoming increasingly important to the strength of the global economy. While the mature economies across the globe are grappling with the issues of towering budget deficits, anaemic growth and rising unemployment, the BRICS nations, albeit still negatively impacted, can nevertheless tackle these challenges by looking internally for more domestic-consumption-driven or investment-induced growth opportunities.

While there cannot be a single, simplistic, one-size-fits-all explanation for the BRICS nations' complex economic and social development phenomena, a remarkable confluence of events marked the beginning of a new era of globalisation roughly two or three decades ago:

Brazil

Brazil's reform efforts have taken place since 1990. The Brazilian economy is led by a group of world-leading firms along with a relatively large number of firms engaging in labour-intensive activities, which account for 60 per cent of the urban workforce (Reisen, 2013).

Russia

After initially falling into a recession arguably as a result of the "shock therapy'"of the 1990s, Russia has experienced significant growth driven mostly by the natural resource sector, as opposed to diversifying into high-value-added activities. At the same time Russia managed to develop a market economy, and many Russian enterprises successfully modernised their equipment and technologies within the last decade. This could be a starting point for improving the structure of production.

India

Elections in India in 1991 brought a pro-reform government to power. India's economic direction shifted from that point forward, with its tightly controlled and inward-looking economy gradually deregulated and opened up. India's growth has been driven primarily by three sectors (information technology, pharmaceuticals and automobiles), which have been brought to the forefront of international competitiveness, leaving behind the previous import-substitution policies.

China

From 1978 onward, China gradually privatised agriculture and opened up to foreign investment and technology, thus speeding up its state-controlled economic transition towards a market economy, in particular since 1992. Driven by industrialisation goals, China has consistently channelled resources from the rural subsistence sector into industrial activities of higher productivity.

South Africa

South Africa has experienced difficulty in diversifying away from its emphasis on the development of natural resources. The fastest-growing sector of the economy has been the financial service industry, followed by the wholesale and retail sectors, with relatively little investment taking place in labour-absorbing manufacturing sectors.

1.3 BRICS in the global economy

The BRICS countries' role as an engine of new consumption-driven growth may shift more dramatically and quickly than many analysts expect. Sustainable growth is the common theme that makes them a powerful and prominent force in the global economy. The BRICS economies jointly accounted for 8 per cent of global GDP in 2000; they are forecast to reach almost one quarter (24 per cent) of the world economy by 2019 (IMF, 2014). A Goldman Sachs (2003) paper predicts that the BRICS economies, which overtook Japan's GDP in 2005, will surpass the United States by 2015 and the G6 by 2040.

TABLE 2
BRICS GDP in the global economy (2000-2019)
(In % of the world total at current price in US$)

	2000	2010	2013	2014	2019[1]
BRICS	8	18	22	22	24
Other emerging market economies	12	16	17	16	17
United States	31	23	23	23	22
Euro area	19	19	17	17	17

Source: IMF (2014).
Note: [1] World Economic Outlook projections for 2019.

TABLE 3
GDP based on purchasing power parity (PPP) ranks

	1990	2000	2010	2013
1	United States	United States	United States	United States
2	Japan	China	China	China
3	Germany	Japan	India	India
4	France	Germany	Japan	Japan
5	China	India	Germany	Germany
6	Italy	France	Russia	Russia
7	India	Italy	Brazil	Brazil
8	Brazil	Russia	France	France
9	United Kingdom	Brazil	United Kingdom	Indonesia
10	Mexico	United Kingdom	Italy	United Kingdom

Source: IMF (2014).

These five countries participate in the international market in quite different ways. Manufactured goods account for 94.0 per cent of total exports from China, in contrast to 59.4 per cent from India and 42.0 per cent from South Africa. Exports of manufactured goods by Brazil and Russia account for 35.1 per cent and 19.3 per cent, respectively, of their total exports. Russia's export basket is dominated by fuel and mineral exports (nearly 71.4 per cent), while agricultural products, fuel and mining products account for nearly 61.6 per cent of exports in Brazil. The demand for South Africa's manufactured goods (nearly 42.0 per cent of total exports) has boosted the country's exports and subsequently contributed greatly to economic growth (see table 4).

Technological developments across sectors in the BRICS economies are more visible over the past two decades, and may also be responsible for the changes in the composition of BRICS exports. The share of high-technology goods in the export baskets clearly indicates an upward trend.

A large percentage of the BRICS nations' import baskets consist of capital goods, indicating the process of large-scale industrialisation in these economies, which is also reflected in their changing composition of commodity exports (see table 5).

TABLE 4
BRICS export composition (2013)

Country	Merchandise exports (US$ billion)	Share of world total exports (%)	Share by commodity (%)			Share by destination (%)				
			Agricultural products	Fuels and mining products	Manufactures					
Brazil	242.2	1.3	37.4	24.2	35.1	European Union (19.7)	China (19.0)	United States (10.3)	Argentina (8.1)	Japan (3.3)
Russia	523.3	2.8	5.7	71.4	19.3	European Union (45.8)	China (6.8)	Japan (3.7)	Kazakhstan (3.3)	Belarus (3.2)
India	313.2	1.7	15.0	25.5	59.4	European Union (16.8)	United States (12.5)	United Arab Emirates (10.1)	China (4.9)	Hong Kong China (4.0)
China	2209.0	11.7	3.2	2.7	94.0	Hong Kong China (17.4)	United States (16.7)	European Union (15.4)	Japan (6.8)	Republic of Korea (4.1)
South Africa	96.0	0.5	11.6	38.1	42.0	European Union (17.7)	China (12.7)	United States (7.2)	Japan (5.8)	Botswana (4.8)

Source: WTO Statistics Database, available at <http://stat.wto.org/Home/WSDBHome.aspx?Language=E>.

TABLE 5
BRICS import composition (2013)

Country	Merchandise imports (US$ billion)	Share of world total imports (%)	Share by commodity (%)			Share by origin (%)				
			Agricultural products	Fuels and mining products	Manufactures					
Brazil	250.4	1.3	5.9	21.7	72.3	European Union (21.2)	China (15.6)	United States (15.1)	Argentina (6.9)	Nigeria (4.0)
Russia	343.0	1.8	13.0	3.0	75.3	European Union (42.6)	China (16.9)	United States (5.3)	Ukraine (5.0)	Belarus (4.4)
India	466.0	2.5	5.2	45.4	38.8	China (11.1)	European Union (10.6)	Saudi Arabia (7.9)	United Arab Emirates (7.1)	Switzerland (5.4)
China	1950.0	10.3	8.5	27.9	58.2	European Union (11.3)	Republic of Korea (9.4)	Japan (8.3)	Hong Kong, China (8.1)	Taiwan, Province of China (8.0)
South Africa	126.4	0.7	7.4	23.7	62.8	European Union (28.4)	China (15.5)	Saudi Arabia (7.8)	United States (6.3)	India (5.2)

Source: WTO Statistics Database, available at <http://stat.wto.org/Home/WSDBHome.aspx?Language=E>.

TABLE 6
Export linkages among BRICS
(US$ billions)

Exports from Russia	Brazil	China	India	South Africa	Advanced economies	Euro area
1990	-	-	-	-	-	-
2000	0.6	5.2	1.1	0.0	60.6	34.1
2010	1.7	19.8	5.4	0.0	208.5	138.8
2013	2.0	35.6	7.0	0.3	314.0	218.0
Exports from India	Brazil	China	Russia	South Africa	Advanced economies	Euro area
1990	0.0	0.0	-	0.0	11.1	3.0
2000	0.3	0.8	0.9	0.3	27.4	7.6
2010	3.7	17.5	1.4	3.6	100.0	32.4
2013	5.4	14.5	2.2	5.3	138.7	38.4
Exports from China	Brazil	India	Russia	South Africa	Advanced economies	Euro area
1990	0.1	0.2	-	0.0	52.0	5.1
2000	1.2	1.6	2.2	1.0	208.3	30.6
2010	24.5	40.1	30.0	10.8	1,107.0	234.1
2013	36.2	48.4	49.6	16.8	1,480.2	243.7
Exports from Brazil	China	India	Russia	South Africa	Advanced economies	Euro area
1990	0.4	0.2	-	0.2	22.9	8.1
2000	1.1	0.4	0.4	0.3	34.6	13.0
2010	30.8	3.5	4.2	1.3	83.0	36.7
2013	46.0	3.1	3.0	1.8	98.5	41.2
Exports from South Africa	China	India	Russia	Brazil	Advanced economies	Euro area
1990	-	-	-	-	-	-
2000	0.3	0.4	0.0	0.2	15.7	6.2
2010	10.4	6.3	0.4	0.8	45.5	15.1
2013	11.8	3.0	0.4	0.7	40.4	13.9

Source: IMF, Directory of Table Statistics.
Obs.: - Not available.

TABLE 7
Summary of external economic relations on BRICS

	2000	2010	2012	2013
Total value of imports and exports of goods and commercial services (US$ million)				
Brazil	137.0	477.7	586.5	607.6
Russia	175.7	762.8	1,034.9	779.9
India	125.9	826.1	1,017.6	N/A
China	530.2	3,264.1	4,264.8	N/A
South Africa	70.2	199.6	172.6	N/A
Value of imports of goods and commercial services (US$ million)				
Brazil	72.4	244.2	304.1	326.3
Russia	61.1	321.0	444.5	344.7
India	65.1	450.3	571.5	N/A
China	250.7	1,520.6	2,016.5	N/A
South Africa	N/A	N/A	N/A	N/A
Value of exports of goods and commercial services (US$ million)				
Brazil	64.6	233.5	282.4	281.3
Russia	114.6	441.8	590.3	435.1
India	60.8	375.8	446.1	N/A
China	279.6	1,743.6	2,248.3	N/A
South Africa	N/A	N/A	N/A	N/A
Inflow of foreign direct investment (US$ million)				
Brazil	32.8	48.5	65.3	64.0
Russia	4.0	43.2[1]	50.6[1]	70.7[1]
India	4.0	34.8	36.9	28.8
China	40.7	105.7	111.7	117.6
South Africa	888.0	1,228.0	4,839.0	N/A
Outflow of foreign direct investment (US$ million)				
Brazil	2.3	-11.6	2.8	3.5
Russia	382.0	52.6[1]	48.8[1]	86.7[1]
India	759.0	17.2	7.1	N/A
China	N/A	68.8	87.8	N/A
South Africa	-271.0	-450.0	-2.4	N/A

Source: BRICS Joint Statistical Publication (2014, p. 155).
Note: [1] Central Bank of Russia.

1.4 Economic structure of the BRICS countries

The output structures of the BRICS economies have changed significantly when compared to previous decades. The declining share of agriculture in GDP has been a common trend over the years. While there has been consistent agricultural growth in Brazil and Russia compared to earlier decades, agricultural performance in India and China has shown greater volatility. Russia has experienced a decline in agriculture's share of GDP, while in Brazil it has remained relatively stable (see table 8).

Agri-business plays a central role in Brazil's economic development, engaging 35 per cent of its workforce and contributing almost 42 per cent of its exports. Brazilian agriculture has undergone dramatic changes in the past few decades. From a net importer of food grains until the 1970s, Brazil has emerged as the major net exporter of food products. A similar trend is witnessed in the case of India, where the Green Revolution and developments in biotechnology have helped the country become self-reliant in food production. With increasing global demand for food and the scarcity of arable land in the world, agronomic conditions will enable Brazil to continue its growth and become a larger supplier of agricultural commodities to nations around the world.

In China, especially since 1991 with the introduction of the socialist market economy system, many changes in urban areas were ushered in. The share of primary industry rapidly declined, while that of secondary and tertiary industries increased. In Russia, measures have been introduced to implement the National Project in Agro-industrial Complex. Among the BRICS countries, South Africa has the smallest share of agriculture in GDP, at around 3 per cent, and its services sector accounts for more than 60 per cent of total GDP (Oxford University Press, 2012, p. 9-11).

Similarly to agriculture, industry – especially manufacturing – has been losing share in BRICS nations' GDP over time. This is true for all five countries, with the only exception of the share of industry (not so manufacturing) in China and India. China is the only BRICS economy where industrial output continues to dominate GDP – at around 45.3 per cent in 2012 (43.5 per cent in 1992).

Another common trend is the rising share of services in GDP. This sector now accounts for over half of GDP in all BRICS countries except China, where it grew from 34.8 per cent in 1992 to 44.6 per cent in 2012. This is a productive structure similar to that of developed economies. The basic difference is that the service sector comprises not only sophisticated, high-technology activities, but also those that come close to underemployment, and in emerging economies the latter tends to be predominant.

TABLE 8
BRICS economic structure
(As % of GDP)

	1992					2002					2012				
	B	R	I	C	S	B	R	I	C	S	B	R	I	C	S
Agriculture	7.7	n/a	28.7	21.8	3.8	6.6	n/a	20.7	13.7	4.2	5.2	4.4	17.5	10.1	2.6
Industry	38.7	n/a	25.8	43.5	36.4	27.1	n/a	26.2	44.8	32.6	26.3	37.6	26.2	45.3	28.4
Manufacturing	24.7	n/a	15.4	32.7	21.9	16.9	n/a	14.9	31.4	19.2	13.3	13.0	14.1	n/a	12.4
Services	53.6	n/a	45.5	34.8	59.8	66.3	n/a	53.1	41.5	63.2	68.5	58	56.3	44.6	69.0

Source: World Bank, country database: <http://goo.gl/fl78xF>; Russia data for 2012: <http://goo.gl/7uTVoy>.

2 MAIN CHALLENGES

2.1 Challenges of the post-financial-crisis era

The rapid growth trend among the BRICS countries since the 1990s faced constraints following the global financial crisis that began in 2008. With the economic slowdown and setbacks in the financial markets in the United States and Europe, exports from BRICS countries to developed markets and investments in their respective economies declined.

The changing global financial conditions highlight the increasing sensitivity of emerging market economies (BRICS included) to changes in external conditions, as these economies have rapidly become integrated into the global economy. In essence, although domestic economic and structural policies remain important determinants of growth, external conditions also deserve attention. If impending changes in the external environment are dominated by an improvement in advanced economies, emerging market economies will benefit in both the short and medium terms. Conversely, if external financing conditions tighten, growth in emerging markets will suffer a relatively lasting effect. Even if external conditions deteriorate, the ability of emerging markets to weather such shocks will be affected by the domestic policies aimed at offsetting those shocks (IMF, 2014, p. 128).

Facing different recovering growth rates in emerging economies and the developed economies, the short-term economic policy of BRICS is confronted with a dilemma. The "rebalancing" of the global economy may lead to slow growth in total global demand and restrict the BRICS nations' space for development.

Furthermore, the re-industrialisation based on the third industrial revolution of the West in the post-crisis era will pose great export pressure on the emerging economies depending on their market development, and also reduce the momentum for development. If the global climate change rules are reset, it might influence and even change BRICS nations' choice regarding the path of industrialisation.

The BRICS countries are at the low end of the global value chain, and the contribution of technological innovation to their economies remains limited, hence weakening their traditional competitive advantage.

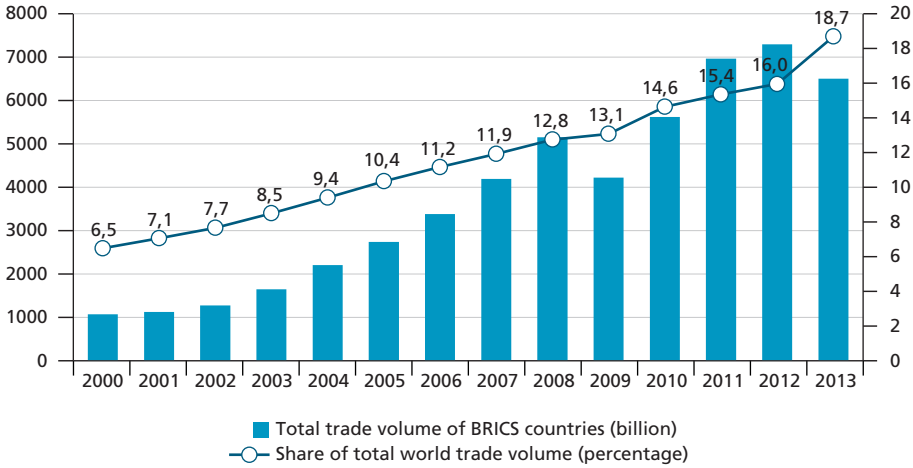
Lastly, the rise of trade protectionism and increasingly complex issues faced by foreign investment might affect global resource allocation.

On the domestic side, inflation rates are generally rising among the BRICS countries, and the declining growth of foreign investment and capital outflow pose serious problems. BRICS countries should improve their domestic market conditions, since low growth may cause vulnerability, instability and lack of sustainability of the domestic economy.

2.2 Trade complementarity and competitiveness of BRICS countries

According to UNCTAD (2014), the overall trade volume of BRICS countries in 2000 was $ 891 billion, accounting for 6.8 per cent of total world trade. Trade attributed to BRICS countries reached $ 6,484.3 billion in 2013, making up 18.7 per cent of total world trade, with an average annual growth rate of 45 per cent. Meanwhile, mutual trade among BRICS countries continued to grow. Trade volume among the BRICS countries was $ 21 billion in 2001 and reached $ 296.4 billion in 2013, increasing by fourteen times. That figure is expected to reach $ 500 billion in 2015. However, trade among BRICS countries merely constitutes a tiny part of total world trade (0.8 per cent in 2013). In addition, its share of the total foreign trade of each country is low. China is one of the main trading partners of the other BRICS countries, while the volume of trade among the other BRICS countries is small, and complementarities of their products are poor (UNCTAD, 2014).

GRAPH 1
BRICS trade and its share in world trade (2000-2013)



Certain measures should be taken by BRICS countries to boost their trade. One possibility would be a platform for the exchange of specific information. Not only should this platform release trade information and related policy information, but it should also provide information on social infrastructure planning and investment, which is closely related with trade, gradually making it a comprehensive information platform for trade and economic cooperation among the BRICS countries.

Exports and imports are subject to currency risk, because international trade transactions are mostly settled in major international currencies. Currency risk factors impede the growth of international trade, as exporters/importers are concerned about the implications of exchange rate fluctuations, especially during times of high currency volatility. A way forward could be to explore the prospect of trade settlement in domestic currencies. This would help mitigate the negative impact of currency volatility on trade and help promote the international use of the BRICS nations' currencies.

China has already made a pioneering effort in this direction by settling some of its bilateral trade in renminbi and promoting an inter-bank and offshore bond market (Hong Kong-based) for renminbi. This would create investment opportunities and liquidity in the market, encouraging wider use of the renminbi for trade settlement. As far as Brazil is concerned, the Payment System in Local Currency (SML in Portuguese) with Argentina began to operate in October 2008. It is a unique system designed by both central banks, which carefully reviewed various international experiences in the area of payment systems, especially those of early intra-regional trade in Europe. All individuals and companies are eligible to participate in the SML in transactions relating to trade in goods and services (such as freight and insurance), which are either imports denominated in Argentine pesos or exports in Brazilian real.

Trade flows between two countries can indicate complementarity between the two economies, if the traded goods originating from each one are different, or some degree of competition, if there is similarity in the trade flows in both directions.

Spearman's rank correlation coefficient is one measure for measuring the revealed comparative advantage in trade between two countries.[1] As shown in table 9, there are three major types of trade relations among the BRICS. First, a stable trade complementarity: China's trade relations with Brazil, Russia and South Africa are complementary, and the strongest complementary trade relations are between China and South Africa, featuring a typical U shape. China-Russia trade relations are also complementary, and show a stable and intensifying trend.

1. A negative coefficient generally shows a complementary nature of trade between the two countries, indicating that they export different products that meet each other's need; a positive coefficient shows a competitive relation, indicating that the two countries export similar products that may potentially compete with each other. The absolute value of the coefficient shows the magnitude of complementarity and competitiveness.

Second, there is a stable trade competitiveness between South Africa and Russia, and South Africa and Brazil. The intensity of trade competitiveness in the two groups is high and increasing. Competitiveness is also strong in Brazil-Russia trade and Brazil-India trade, but this seems to be decreasing in magnitude over time. Trade competitiveness between Brazil and India is alswo decreasing. Trade competitiveness between Brazil and Russia features an inverted U shape.

Third, two pairs of countries have seen a change between competitiveness and complementarity. Trade between India and Russia was complementary before 2005, but by 2009 it had become slightly competitive. On the other hand, trade between India and South Africa has turned from competitive to complementary.

TABLE 9
Trade complementarity and competitiveness among BRICS countries (2001-2009)

	2001				2005			
	Brazil	Russia	India	China	Brazil	Russia	India	China
Russia	0.2652	-	-	-	0.4831	-	-	-
India	0.2130	-0.1033	-	-	0.0936	-0.0422	-	-
China	-0.1789	-0.2109	0.2720	-	-0.1514	-0.2123	0.1969	-
South Africa	0.3685	0.4934	0.1014	-0.2868	0.4577	0.6467	0.0199	-0.2234
	2009				2001-2009			
Russia	0.3333	-	-	-	0.4245	-	-	-
India	0.1032	0.0169	-	-	0.1214	-0.0910	-	-
China	-0.2866	-0.2634	0.2205	-	-0.2273	-0.2695	0.1681	-
South Africa	0.5433	0.6495	-0.0044	-0.3542	0.4285	0.6059	0.0464	-0.2696

Source: The Spearman's rank correlation coefficient adopted from Wu (2012, p. 27). All pairs of trade relations are listed in the table.

BRICS countries should come up with proactive policies that reinvigorate their domestic economies and also establish strong economic relationships among themselves. It is important for them to forge stronger relationships to expand their domestic markets to revive growth. This will also help them reduce to some extent their excessive dependence on exports to markets in developed countries.

An open world economy will benefit all. BRICS countries are committed to establishing a post-Bali work programme to conclude the Doha Round, so as to build an "open, inclusive, non-discriminatory, transparent and rule-based multilateral trading system", according to the Fortaleza Declaration released following their sixth summit (China Daily, 2014). As shown in table 10, there has been limited progress in the negotiations in the Doha Round so far. As the share of the BRICS countries' trade and investment in total global trade and investment grows, they have been playing an increasingly important role in the multilateral trading system. The current mega agreements being negotiated, such as the Trans-Pacific

Partnership (TTP), Transatlantic Trade and Investment Partnership (TTIP) and others, have also presented the BRICS nations with new challenges, which need to be carefully studied.

TABLE 10
Progress and sticking points on trade negotiations in the Doha Round

Progress	The Doha Round subsequently became the Bali Agenda. Agreement at Ministerial Conference includes ten texts which comprise the Bali Package; these include in relation to: Trade Facilitation; General Services; Public Stockholding for Food Security Purposes; Understanding on Tariff Rate Quota Administration; Export Competition; Cotton; Preferential Rules of Origin for Least Developed Countries; Operationalisation of the waiver concerning preferential treatment to services and services suppliers of least developed countries; duty-free and quota-free market access for least developed countries; and a monitoring mechanism on special and differential treatment.
Sticking points	Liberalisation in the agricultural sector and food security issues. Food security and the issue of public stockholding, although there is a formal commitment to address them. Still no binding commitments on export subsidies in agriculture, although this is a priority area for the post-Bali work programme
Divergence in positions	Regarding the single undertaking and further liberalisation, there is a clear divergence in positions between developed countries and emerging economies (e.g. the United States versus India). The developed countries wish to move further and faster than developing countries. Agreement has been reached on the Bali Agenda, and in particular resources made available for trade facilitation. No divergence in positions is apparent. Some countries are negotiating for an international services trade agreement. Still disagreement over treatment of the United States and the European Union subsidies versus Indian safeguards.

Table 11 presents the evolution of preferential trade agreements (PTAs) and regional trade agreements (RTAs) signed by BRICS, the United States and the European Union since 2000. The European Union can be seen to have the largest number of RTAs and PTAs in force. As influential regional powers, the BRICS countries have made significant progress in regional and inter-regional trade and economic cooperation.

TABLE 11
PTAs signed by BRICS, the United States and the European Union

Country	FTAs in 2000	FTAs in 2005	FTAs in 2010	Present number of FTAs
Brazil	4	4	5	5
Russia	13	14	15	16
India	3	7	14	16
China	1	5	10	11
South Africa	3	4	5	5
European Union	17	24	33	38
United States	6	10	15	18

Source: WTO database.
Obs.: Totals are cumulative; date of entry into force used.

Both China and India have signed free trade agreements (FTAs) with the Association of South East Asian Nations (Asean) and played important roles in

the ASEAN+6 mechanism. Brazil has been actively promoting and participating in the Latin American integration process. As early as 1991, it established a common market along with Argentina, Paraguay and Uruguay, and it has continued to play a leading role in economic integration. While South Africa succeeded in promoting the Southern African Development Community (SADC), it was active in integrating the Common Market for Eastern and Southern Africa (Comesa) and East African Community (EAC) into a free trade zone covering 26 countries from eastern and southern Africa. South Africa has also been actively promoting the FTA negotiations between the Southern African Customs Union (Sacu) and the common market of South America.

Russia joined the WTO in 2011, which is relatively late compared to the other BRICS nations. Before that, Russia was active in trade and economic cooperation under the framework of the Commonwealth of Independent States and the Shanghai Cooperation Organization (SCO). On 27 November 2009 the Heads of State of Russia, Belarus and Kazakhstan signed the Customs Code of the Customs Union, marking the official establishment of a customs union between the three countries within the framework of the Eurasian Economic Community. This Customs Union plans to launch FTA negotiations with more than thirty countries worldwide. In addition, there are more than thirty Arab and Latin American countries that have proposed the establishment of free trade with this Customs Union.

In terms of bilateral cooperation between BRICS countries, cooperation between China and Brazil is the most extensive. Since the global financial crisis, China has replaced the United States as Brazil's largest trading partner. These two countries have closely cooperated in a variety of fields including public policy, defence, science and technology, water conservation, quality inspection, sports, education, agriculture, energy, telecommunications, aviation etc. In Latin America, China has also established strategic partnerships with Mexico and Argentina and signed FTAs with Chile, Peru and Costa Rica. China and India have completed a report on the feasibility of establishing a bilateral FTA. China is conducting a trade facilitation process with Russia, and negotiations with Sacu are in progress. India has already signed bilateral FTAs with South Korea, Singapore and Thailand and chose to negotiate with smaller economies such as Pakistan, Sri Lanka, Nepal, Maldives and Chile for the establishment of bilateral FTAs.

By optimising their tariff structure, the BRICS countries can raise the level of trade facilitation, enhance export promotion via exhibitions, seminars and symposiums, organise investment and trade promotion missions, build chambers of commerce, and divulge specific real-time information.

The desire to integrate into regional and global production chains is a driving force today. It is not only manufacturing that is important in climbing the ladder

of development, but also services, which account for a larger share of value in regional and global production chains. These factors tend to reinforce the role of the WTO in global trade regulation, although they also bring challenges that the multilateral trading system needs to address: given the negative effects of divergent and complex rules of origin present in regional agreements, multilateral negotiations may be more effective and beneficial in facilitating global production chains.

Developing countries have now become an important part of global production chains and have rapidly integrated into the tide of global production since the 1990s. Especially after the computer and information technology revolution in Europe and the United States, BRICS countries have become more integrated into the global division of labour.

Industrial development in BRICS nations has contributed to this upgrading process. By improving infrastructure and attracting foreign direct investment (FDI), China actively pursued the development of its manufacturing industries and has since become the world's factory. India developed a software-outsourcing service by leveraging its competitive advantages in language and labour cost, and became the world's office. Russia, Brazil and South Africa took full advantage of their natural resources, becoming suppliers of energy, resources and raw materials.

There are no conditions for a complete value chain to form within the BRICS countries, which requires future breakthroughs if they want to maintain their current momentum of development. Hence, BRICS countries should develop a good communication and coordination mechanism and deal with possible mutual competition issues in the global value chain among the BRICS countries. They should coordinate their industrial development strategies, with better alignment of their policies towards industrial safety, investment etc.

2.3 Intra-BRICS direct investment

The share of BRICS nations in global direct investment inflows increased from 11 per cent before the 2007 crisis to 21 per cent in 2013. Their share in global outflows was 6 per cent in 2013 (UNCTAD, 2014). China ranked first among BRICS countries both in terms of attracting FDI and in terms of Outward Direct Investment (ODI) in 2013. In terms of FDI inflows, Russia ranked second, followed by Brazil, India and South Africa. It is worth mentioning that China, Russia, Brazil and India were among the top twenty host economies for FDI inflows in the world.

As far as ODI is concerned, Russia ranked second, with Brazil next, followed by India and South Africa. China and Russia were among the top twenty home economies for ODI outflows (ibid.).

In recent years, India has increased its FDI and provided a large number of world-renowned multinational corporations. Russia's overseas investment mainly concentrates on industries where it has comparative advantages, such as oil, gas, metallurgy and mining. However, mutual investment among BRICS countries remains relatively small.

According to UNCTAD (2014), FDI associated with the BRICS countries is expected to grow by more than ten times within the 21st century. Mutual investment between the BRICS countries will become a new area for pragmatic cooperation. Intra-BRICS investment is mostly "resource-seeking". The five countries should try and alter this profile, since productive complementarity may demand other types of FDI.

2.4 Financial issues

The BRICS currencies have been gradually gaining in importance. According to the latest Bank for International Settlements (2013) survey, the renminbi was the ninth most actively traded currency, with 2.2 per cent market share in 2013, a significant increase from its 35th place in 2001. The Russian ruble was the next most traded BRICS currency, in 12th position worldwide, accounting for 1.6 per cent of global trade. The South African rand, Brazilian real and Indian rupee were in 18th, 19th and 20th position, respectively.

BRICS nations should set up research collaboration on enabling conditions for internationalisation of their respective currencies, such as transparency and capital account convertibility.

On 23 June 2011 the People's Bank of China, authorised by the State Council, signed a new bilateral local currency settlement agreement with the Central Bank of the Russian Federation. Chinese and Russian bilateral local currency settlement will cover not only border trade but also general trade with expanded geographic areas. According to the new agreement, economic entities from both countries will be able to conduct settlements and payments for trade in goods and services with a currency of their choice: either a freely convertible currency, the renminbi or the ruble.

China and Brazil signed a $ 30 billion currency swap deal on the sidelines of the fifth BRICS summit in South Africa, so that normal trade operations between the two nations can be guaranteed if a future financial crisis affects global liquidity.

The fourth BRICS summit in India concluded the Master Agreement on Extending Credit Facility in Local Currency and the Multilateral Letter of Credit Confirmation Facility Agreement between export-import and development banks within the BRICS Interbank Cooperation Mechanism including settlements. This Mechanism would serve as a useful instrument for cutting trading costs and enhancing intra-BRICS trade and investment in coming years.

BRICS countries should seek to jointly construct a platform for dialogue on monetary and fiscal policies and expand the spaces for monetary policies. They should participate fully in the formulation of international financial standards and rules, make the best use of achievements in international financial reform, and implement international standards to achieve internal reforms and to improve their own standards of financial rigour.

In the future, BRICS nations are supposed to continue to enhance their financial ties by boosting investment exchanges, expanding currency swaps, encouraging trade settlement in local currencies and promoting convertibility among their currencies to prevent capital outflows.

3 OTHER ISSUES TO FOSTER BRICS COUNTRIES' COMPETITIVENESS AND COMPLEMENTARITY

3.1 Agriculture

It is important that BRICS countries expand their cooperation in agriculture. Since they are all coastal countries, they could also actively expand cooperation in the fisheries sector to explore growth opportunities in the blue economy. To complement each other's advantages and achieve common development, they could join forces in fields such as the production, storage and trade of agricultural products, logistics and technology from a resource complementarity, technology exchange and industry cooperation perspective.

As the most advanced of the BRICS countries in agricultural science and technology, Brazil could offer a platform for other countries to learn from its experiences in agricultural technologies and environmental protection and regularly hold experience-sharing activities. This should be met by technology sharing in other, non-agricultural areas.

By launching information-sharing and communication activities centring on common issues in agricultural development, exchanging agricultural information regularly, setting up an agricultural information and digital agriculture platform and by building an information exchange mechanism, BRICS countries can gradually enrich and perfect their food security information systems.

Communication and cooperation can be enhanced in fields such as advanced agricultural technologies, equipment and technical personnel. In the process of mutual learning, absorbing each other's advanced technologies and technological innovation, special attention could be paid to the following aspects: enhancing the research and development of new high-quality, high-yield and disease-resistant species; developing new styles of agriculture featuring low water intensity, farmland protection and green manufacturing; and promoting the establishment of a resource-saving and environmentally friendly agriculture.

It is important that BRICS countries strengthen their coordination and communication with other international and regional organisations; actively participate in major activities held by the G20, the UN Food and Agriculture Organization, the International Epizootic Office, the Consultative Group on International Agricultural Research etc.; coordinate their views on food security, environmental protection, trade promotion and other hot agricultural topics; and find common ground to continuously contribute to safeguarding the world's food security.

Apart from enhancing cooperation among the BRICS countries, they also need to improve their coordination and cooperation on agriculture with other countries and work with them to reduce the number of people living in extreme poverty, make positive contributions to achieving the UN Millennium Development Goals as soon as possible and promote stability, prosperity and development throughout the world.

3.2 Infrastructure

As the New Development Bank is now established, the BRICS nations should continue to innovate in their financing methods to achieve diversified financial channels and to offer financial support to basic infrastructure construction. The participation of private capital is also welcomed in joint efforts, which is a priority for all BRICS members. For more detailed information, please refer to chapter 4.

3.3 Energy

Energy plays a very important role in developing countries' development path. Given the political instability in many parts of the world and large fluctuations in energy prices, many countries have sought energy security as part of their national strategic goals. Among the BRICS countries, Russia is a major exporter of energy resources, while China and India are major importers. BRICS should strive to share these energy security goals and help maintain the global stability of energy prices.

The BRICS countries could establish an energy research association (e.g. an energy policy institute and fuel reserve bank) to coordinate research and development on traditional and renewable energy sources and consider the feasibility of an energy bank to leverage intra-BRICS energy trade. Through international cooperation, BRICS countries should ensure that the development of nuclear energy is done in a way consistent with relevant safety standards.

The BRICS countries could also work together to explore a new path of industrialisation, including smart transportation, information and communication, as well as safety regulation of the energy sector.

3.4 Information and communication technology, e-commerce and smart society

To foster competitiveness and complementarity among BRICS economies, one important component is the exchange of information, not only in terms of experiences but also in terms of actual business opportunities in each country. This can be achieved, for example, by means of a cross-department, trans-regional, multi-industry and trans-boundary national-level electronic commerce network, using the latest technology available.

3.5 Urbanisation

BRICS should strive to establish an urbanisation partnership among its member states at an early date. BRICS countries should work with each other and find joint responses to economic, social and environmental challenges during the process of urbanisation and share experiences through this platform. Chapter 3 discusses this issue in more detail.

3.6 Small and medium-sized enterprises

Small and medium-sized enterprises (SMEs) are important actors in the economies of BRICS countries, in that they account for a good deal of the creation of job opportunities, at the same time that they are instrumental in providing diversification of the productive structure and trade composition of external trade flows.

It is, however, quite costly for SMEs to access information about external opportunities, as it is also costly to cope with the initial costs of their involvement in external trade activities. It is, therefore, a challenge for BRICS countries to provide the means that might facilitate the operations of their SMEs in intra-group activities.

BRICS should encourage their SME associations and development centres to build contacts, and motivate them to collaborate via staff training, information consultation and other forums.

3.7 BRICS in South-South cooperation

The role of Brazil, Russia, India, China and South Africa as emerging leaders in international development cooperation is changing significantly and rapidly. Over the last decade, the BRICS nations have increased their financial and technical assistance to developing countries, and established distinct ways and means of economic cooperation, especially through South–South cooperation with low-income countries. The impact on low-income countries through trade, FDI and development financing is significant, and coherent with the BRICS aim of striving for more political influence in the world.

4 RECOMMENDATIONS

4.1 Overall

To achieve the post-2015 development goals, the BRICS nations should:

- maintain their fast economic growth and lead as the engine of the world's economic development;
- expand trade among themselves and with the rest of the world;
- adjust their economic growth patterns while strengthening their traditional competitive advantages to seek technological innovations to drive the economy;
- realise an economic transformation and establish a new economic growth engine;
- improve their position in the global value chain and global production networks;
- actively cope with global climate change, develop clean energy technologies and realise the sustainable development of the economy;
- gradually reduce income inequality and eliminate social injustice to achieve the inclusive development goals; and
- maintain economic stability by improving the industrial safety management system.

BRICS countries should emphasise comprehensive multilateral agreements on matters including goods, services, competition, intellectual property and short-term labour flows, to promote open markets between them and further amplify the impact of trade liberalisation on investment, production and employment.

BRICS countries should enhance their cooperation in supervising international finance, optimise the bilateral supervision mechanism by instituting a coordinating mechanism among financial regulators to improve their regulation measures, improve market transparency and decrease the asymmetry of information.

BRICS countries should enhance their governance cooperation, promote coordination among their monetary authorities in managing cross-border capital flows, work together to build a supervision mechanism for the macro-economy and financial markets and build a regional international financial security net to step up their monitoring of global capital flows and to avoid the cross-border transmission of financial risks.

BRICS countries should increase their engagement with other countries, particularly developing countries and emerging market economies, as well as with international and regional organisations, with a view to fostering cooperation and solidarity with all nations and people.

4.2 On trade and investment

BRICS countries should work together to identify promising areas, sectors and markets that offer a potential expansion in trade in goods and services for mutual benefit.

A platform for sharing trade and economic information among BRICS countries could be built. Through this platform, enterprises would be able to understand trade and economic policies in each BRICS country, share market information with each other and establish broader trade and economic ties so that trade between the BRICS countries can grow soundly and rapidly.

The BRICS nations are supposed to encourage their trade and investment facilitation agencies to establish closer ties. They should also provide policy support to customs authorities to work with each other. In addition, it is hoped that the BRICS countries should strengthen exchanges and cooperation in the field of high and new technology. They should also facilitate mutual investments by small enterprises.

BRICS countries should expand their cooperation to exhibit their products and services and to develop other trade and investment promotion platforms. They should improve the transparency of the trade and investment environment in accordance with laws and regulations in each country.

BRICS countries should study the possibility of establishing bilateral or multilateral trade and investment dispute mediation and arbitration agencies to resolve disputes and conflicts in trade and investment activities.

BRICS countries should consider the establishment of a comprehensive multilateral agreement that includes goods, services and supplies, competition, intellectual property rights and short-term labour flows, promote open markets among the BRICS countries, and further enlarge the impact of trade liberalisation on investment, production and employment, so as to create the best and most favourable environment for expanding the global value chain.

BRICS nations could launch initiatives to encourage their leading companies to take the lead in global value chains, while assisting their SMEs to share the benefit from the evolution of global value chains, upgrade their industries and local economies and create more jobs and opportunities. BRICS must support research aimed at understanding the impacts of integrating into global value chains on growth, productivity and job creation.

Among other initiatives to foster trade, and as stated in the Fortaleza Declaration, there should be a pool of capacities in the insurance and reinsurance market, as well a formal agreement among export credit and guarantees agencies, as mentioned in the Memorandum of Understanding on Cooperation among BRICS Export Credit and Guarantees Agencies. BRICS countries should also study the benefits of a possible Customs Mutual Assistance Agreement.

4.3 On financial and related issues

The BRICS banking sector could play an important role in promoting trade and investment through innovative trade financing facilities, export credit arrangements, and countercyclical measures which ensure that trade financing is not adversely affected during business downturns, as was the case during the recent global financial crisis.

As trade and investment have grown rapidly over the past few years among the BRICS countries, greater use of local currencies in trade settlement and related financing activities would be beneficial to all. Financial institutions from the BRICS nations should expand local currency settlement and lending to facilitate the countries' economic growth as well as to enhance the influence of their local currencies.

BRICS nations should explore the prospect of trade settlement in domestic currencies. This would help mitigate the negative impact of currency volatility on trade.

BRICS countries could establish a financial market development and stability fund to develop a BRICS bond market.

BRICS countries should investigate the merits of signing an investment protection agreement to promote mutual investment among BRICS countries.

According to the Fortaleza Declaration (Art. 17), there should be a cooperative approach on issues related to tax administration and cooperation in the international forums targeting tax evasion.

4.4 On other issues to foster competitiveness and complementarity

BRICS countries should strengthen exchanges and cooperation in high-tech fields when conducting mutual investment, and provide a platform for entrepreneurs from each country, through which they will be able to launch product and industry dialogues and gradually achieve a clustering advantage in business management, technological innovation and platform marketing.

Promoting exchanges and cooperation between SMEs through a cooperation platform could provide more opportunities for the BRICS nations to realise both upstream and downstream extensions in value chains. BRICS nations should

strengthen mechanisms to disseminate information to SMEs, offer financial, information and human resources support and develop experience.

Building on the existing BRICS Exchange Alliance, countries should consider creating a mechanism for listing SMEs on a BRICS SME Stock Exchange, to foster investment. They should also consider the possibility of signing a BRICS SMEs Cooperation Agreement.

The BRICS countries should carry out human resources cooperation programmes to promote the flow of science and engineering talent and the development of human resources by means of technological investigation, international conferences, skills training, information exchange, sci-tech exhibitions etc.

The BRICS countries should enhance their agricultural productivity to ensure food security, and pay attention to the protection of arable land, the application of new agricultural technologies and ecological safety.

BRICS countries should pay attention to the negative effects of climate change on agricultural productivity, especially the destructive effects caused by extreme weather (chapter 3 discusses this issue in more detail). They should enhance communication and collaboration in developing adaptive agricultural techniques and measures, and seek to improve agricultural efficiency and productivity in a sustainable manner.

BRICS countries should work together, find common ground to form a united negotiating bloc in global climate-change negotiations and strive for a fair outcome in future negotiations.

BRICS countries should enhance their cooperation in the energy field, share their technologies and experiences in energy exploration and use, enhance safety in the energy sector, improve energy efficiency, ramp up their joint efforts in the development and use of new and clean fuels, strengthen investment in and the infrastructure of new energy, and increase the proportion of renewable sources in energy consumption.

The BRICS countries should establish an energy research association to coordinate research and development on traditional and renewable energy sources and consider the feasibility of an energy data bank to leverage intra-BRICS energy trade.

BRICS countries should strengthen their cooperation in the area of communication technology and urge their research institutions to join in developing new information and communication technologies to improve their overall information level.

BRICS countries should try to build a cross-department, trans-regional, multi-industry and trans-boundary national-level electronic commerce network

connecting the whole world to offer necessary business information and services to their enterprises and to publish their business opportunities and policy changes in real time.

BRICS countries could also hold regular intelligent society forums to provide platforms for member countries to share experiences in building intelligent society, developing information technology and improving their information level.

BRICS countries should focus on exchanges and communication in aspects that have close connection with urbanisation, such as related strategies and policies, city planning, industrial economy, public services, basic infrastructure, housing security, energy management, intelligent transportation, green buildings, environmental protection etc.

BRICS should facilitate cross-border population flows among member countries, such as by offering tourist visa or tourist group discounts. They should aim at eventually eliminating intra-BRICS visas.

CHAPTER 2

POLITICAL AND ECONOMIC GOVERNANCE

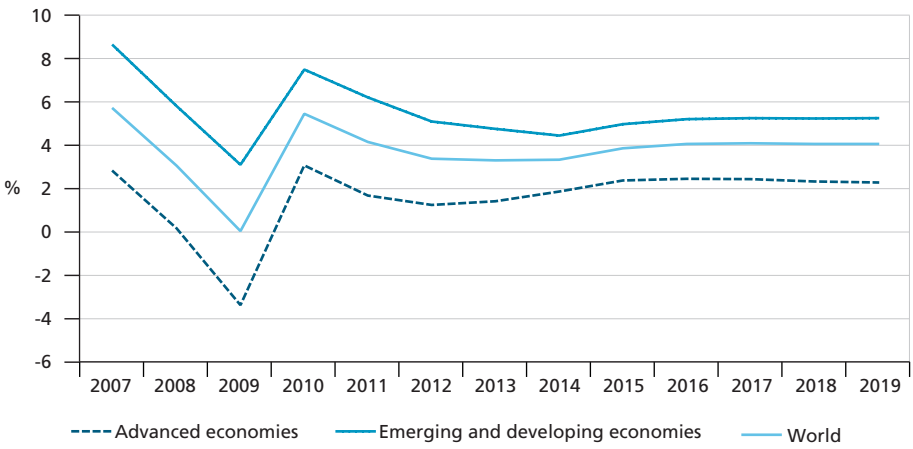
PILLAR

BRICS member states should share experiences and improve existing initiatives on good governance and transparency both within the ambit of global multilateral cooperation and domestically in member countries.

1 CURRENT SITUATION

The global economy has been showing signs of a recovery following the financial crisis. According to the International Monetary Fund (IMF) *World Economic Outlook*, released in October 2014, global growth is projected to strengthen marginally from 3.28 per cent in 2013 to 3.31 per cent in 2014 and 3.85 per cent in 2015. However, given poor economic data in the first half of 2014 and an increase in downside risk, these numbers have been revised downwards – and the long-term outlook is still uncertain.

FIGURE 1
Growth prospects (2007-2019)



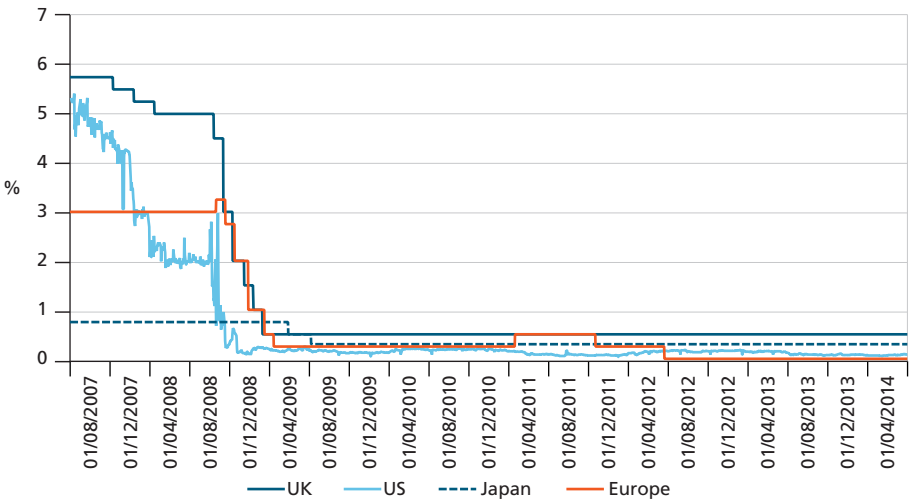
Source: IMF, World Economic Outlook, Oct. 2014.

While it is likely that the global Gross Domestic Product (GDP) will increase, the pace of growth itself is uncertain. In 2015, the advanced economies are expected to grow at about 2.4 per cent, nearly one percentage point greater than the growth rate in 2013. At the same time, growth in emerging and developing

economies is projected to be about 5.0 per cent in 2015, compared with 4.7 per cent in 2013. The relative percentage change in the growth rate of emerging and developing economies is less than that for advanced economies, indicating a slower recovery than anticipated.

Additionally, the quality of growth is far from certain, with real economic data (e.g. industrial, employment data) not showing any significant improvement. Instead, the meagre growth achieved so far, especially in advanced economies, can be attributed to attempts at demand augmentation via a reduction in fiscal tightening (except Japan), as well as liquidity-boosting measures via extremely accommodative unconventional monetary policies (UMPs). Large-scale Quantitative Easing (QE) programmes, as undertaken by Central Banks in the USA and Japan have flushed the economies with liquidity and suppressed long-term interest rates. QE in the USA alone expanded the Federal Reserve's balance sheet from less than USD1 trillion in 2007 to more than USD 4 trillion currently, and pushed the nominal interest rates to the zero lower bound. Moreover, central banks in several advanced economies have also pushed short-term nominal interest rates to near zero levels to ease credit constraints (figure 2). In fact, in June 2014, the European Central Bank (ECB) introduced negative deposit rates for the first time.

FIGURE 2
Central Bank base rates (2007-2014)

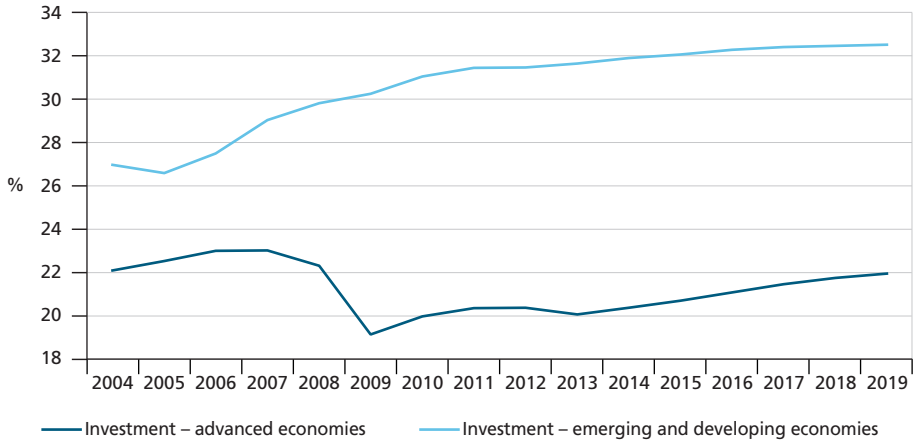


Source: ECB, BoJ, Federal Reserve, BoE.

Although the UMPs have mitigated the immediate adverse effects of the crisis, and have had a positive impact on unemployment, they have not had a commensurate effect on investment growth (figure 3). Advanced economies' central

banks are struggling to mitigate deflationary trends and have not yet been able to commit to a definite timeline on withdrawing liquidity support. All of this points to a danger of secular stagnation – a permanently lower trend of growth.

FIGURE 3
Investment-GDP ratio (2004-2019)



Source: IMF, World Economic Outlook.

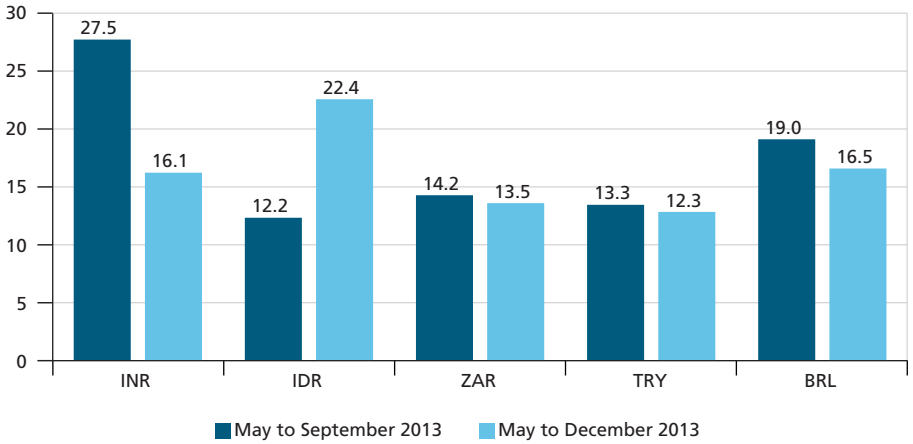
In addition, the UMPs have become a systemic source of spill-overs on the global financial markets. In particular, the low interest rate environment in advanced economies has led to a "search for yield" in risky alternative assets – a phenomenon that has led to "hot money" flows in emerging and developing economies such as those represented by BRICS. Recent data on high valuations on equities, narrow credit spreads, low volatility and abundant corporate bond issuance confirms this. Investors and corporations have displayed a strong appetite for risk. There is a fear that UMPs have facilitated the creation of asset bubbles, as financial market performance has dissociated from real economic performance (Bank for International Settlements, 2014) – for instance, since 2009, USD 1.2 trillion has flowed into global bond funds, compared with USD 132 billion into equities (Tett, 2014). New sales of "junk" bonds[1] worldwide hit a quarterly record of USD 148 billion between April and June 2014, up from the average quarterly sales of around USD 30 billion before the previous credit bubble burst (Dolan, 2014). Such misallocation of capital can seriously detract from a resilient economic recovery.

In May 2013, the US Federal Reserve's announcement of tapering its QE programme – scaling back purchases of government securities by USD 10 billion per month – led to a huge outflow of capital from emerging and developing economies

1. As per the Standard and Poor's definition, bonds rated BB or lower are classified as Junk Bonds.

and resulted in a deterioration of their current account deficits along with a sharp depreciation of their domestic currencies. By September 2013, the Indian Rupee and the Brazilian Real had each fallen by more than 16 per cent (Kumar and Barua, 2013). To maintain sustainable exchange rates, nominal interest rates were raised at the expense of real economic growth.

FIGURE 4
Exchange rate depreciation (May-December 2013)
(In %)



Source: Yahoo finance.

2 MAIN CHALLENGES

2.1 BRICS and the global financial architecture

Emerging and developing economies can coordinate and effectively use the International Financial Architecture to address common concerns. The Group of 20 (G20) can be a particularly useful platform for this. In addition, BRICS has made rapid strides in burden sharing and financial integration towards a more robust global economy.

In 2009, at the height of the financial crisis, the heads of the G20 nations met in London to draw up an action plan to stabilise the global economy. This led to the trebling of the IMF's resources to USD 750 billion, establishment of a new Financial Stability Board (FSB) and a USD 100 billion increase in the lending capacity of the Multilateral Development Banks (MDBs).

Despite the efforts made by the G20 the global economy still stands on a shaky foundation. Emerging and developing economies could still be affected by spill-overs originating from changes in advanced economies' policies and

performance, as well as by excessively borrowing from financial institutions. Recent crises have shown the importance of creating mechanisms to make these institutions participate in the adjustment processes of the affected economies.

The actual role of risk rating agencies is an additional issue, in that their usual criteria for risk classification is far too concerned with liquidity and solvency, disregarding other indicators of the actual economic potential of developing countries. Also, their high ratings to a number of financial operations have contributed to deepen the recent sub-prime crisis.

Excess liquidity spill-overs lead to cross-border banking flows, exchange rate volatility, and overvalued assets in capital-receiving countries (Rajan, 2013). These spill-overs work via a channel of easier borrowing that increases asset prices and reduces leverage-linked risk perceptions. Concomitantly, the timing and pace of withdrawal of UMPs should be sensitive to the prevailing financial conditions in the emerging and developing economies.

Surges in capital outflows have resulted in an array of macro-prudential measures such as a 2 per cent tax on equity and bonds by Brazil (Wheatley, 2009), as well as a restriction on outward investment from 400 per cent of the investor's net worth to 100 per cent in India (Mallet, 2013). Such measures in addition to hikes in domestic interest rates are a natural defence against short-term spill-overs from UMPs. To build long-term resilience, however, emerging and developing economies have once again started accumulating foreign exchange reserves to prevent future outflows and exchange rate destabilisation. Advanced economies should consider the long-term implications of the UMPS, chief among them the formation of a new savings glut.

Systemically Important Financial Institutions (SIFIs) are defined as financial institutions in which distress or disorderly failure – because of their size, complexity and systemic interconnectedness – can cause significant disruption to the wider financial system and economic activity (Financial Stability Board, 2011). Governments around the world have been forced to bail out such institutions following the financial crisis. This has created a moral hazard and exacerbated already precarious fiscal budgets.

The G20 has tasked the FSB with the development of a multi-pronged framework to reduce the likelihood of failure of SIFIs, prevent large taxpayer bailouts by orderly resolution of a failing SIFI and minimise the systemic risk via macro-prudential regulation. Although unilateral efforts such as the Dodd-Frank Act of 2010 as well as a series of 'stress tests' have sought to limit systemic risk in the financial system, they have inadvertently also forced banks to limit their exposure to riskier loans and scale down their operations, especially in the emerging and developing economies. However, it is important to ensure that BRICS countries are able to balance greater regulation with domestic growth imperatives such as infrastructure creation.

2.1.2 Basel III

Basel III is a comprehensive set of recommendations, developed by the Basel Committee on Banking Supervision, to strengthen the regulation, supervision and risk management of the banking sector. Although G20 members have broadly agreed to the recommendations within the Basel III framework, important concerns have been raised in the past by the emerging and developing economies. These must be addressed in line with the implementation timeline of the regulations.

The first regards capital requirements. Recent research has found that a 20 per cent increase in capital stocks and liquidity reserves would diminish GDP per capita by 2 per cent globally, but by 3 per cent in emerging and developing economies (Masters, 2012). The Basel III framework has also introduced a Countercyclical Capital Conservation Buffer (CCCB) that prevents banks from excessive lending during periods of high credit growth. For example, the CCCB is triggered when indicators such as the credit-GDP gap[2] reach a predetermined threshold limit. However, given different circumstances for emerging and developing markets, such as stage of economic development, maturity of financial markets and the progress of structural transformation, non-contextual application of these indicators could undermine the priority of economic growth.

The second related concern pertains to stringent liquidity requirements. Under the Basel III framework, banks are required to maintain a minimum Liquidity Coverage Ratio (LCR) to ensure that they have sufficient High Quality Liquid Assets (HQLA) to survive a stress scenario lasting 30 days (Bank for International Settlements, 2013). The HQLA typically comprises short-term government securities and high-quality corporate bonds – instruments that are in limited supply in capital markets of many emerging and developing economies.

2.1.3 Burden-sharing arrangements

The volatility of capital flows in emerging and developing economies stemming from UMPs in advanced economies exposes a fundamental vulnerability in their macroeconomic model. To counter this, emerging and developing economies have typically resorted to the rapid accumulation of foreign exchange reserves. IMF lending has been used as a last resort by countries unable to summon the adequate financial resources to prevent a full-blown crisis. Most recently, the foundations of the Contingent Reserve Arrangement (CRA) were established by BRICS.

The CRA is a framework for the provision of support through liquidity and precautionary instruments in response to actual or potential short-term balance of payments pressures, with an initial size of USD 100 billion.

2. The difference between actual credit–GDP and long-term trend of credit–GDP.

Drawing on the experience of other regional cooperation arrangements, the CRA has adopted a two-tier governance and decision-making structure, with strategic issues decided by consensus of a Governing Council and operational issues decided by majority votes of a Standing Committee. Votes are in proportion to individual members' committed resources, with a certain portion of basic votes equally distributed among members.

The CRA provides two instruments in response to different BOP pressures, a liquidity instrument to address the actual BOP difficulties and a precautionary instrument to preempt any potential pressures before the actual ones emerge. Both instruments are to help stabilize expectations, reduce uncertainties and improve market confidence, therefore, to mitigate the adverse impacts of external shocks and stabilize the domestic situation for BRICS.

Financial operations under CRA are well secured. The CRA requires most drawings of committed resources to be linked to the IMF arrangement. Nevertheless, to allow prompt support under urgent conditions, up to 30 per cent of the maximum access could be drawn upon approval in the absence of an IMF arrangement. Besides, the CRA also requires comprehensive conditions to be met for the approval of any drawing or renewal request, and specify members' obligations under the CRA arrangement.

Given the rising volatilities and risks on the global market, and the standstill quota reform and inadequate resources of the IMF, emerging markets have to resort to regional and bilateral monetary cooperation to seek financial stability in an in complete global financial safety net. The CRA as a cross-region monetary cooperation will supplement the global financial safety net by adding a new layer and new resources available, helping to strengthen financial stability of BRICS and the world as well. Moreover, by launching the CRA, the BRICS countries have not only make solid progress towards multilateral cooperation, but also enhance the collective capacity of coping with external shocks, and provide continuous momentum and broader potential for future cooperation. However, safety nets fail to completely insure the inherent systemic risk that emanates from adverse spill-overs from UMPs and an over-reliance on the US dollar. BRICS collectively could evaluate more alternatives to minimise systemic risk by exploring arrangements that target underpinning systemic issues in the global financial system.

2.1.4 Alternatives to the US dollar

Empirical literature (Papaioannou and Portes, 2008) identifies certain key factors for internationalisation of a currency: economic strength and market size; low inflation and exchange rate stability; deep and efficient financial markets; and political stability and geopolitical strength. The US dollar fulfils the above

criteria. Additionally, the financial crisis and the ensuing QE programmes have not diminished the dollar's role as a "safe haven" asset. Indeed, the strength of the US dollar can be seen from the two tables below – it is the dominant currency in the global foreign exchange market as well as the international money market.

TABLE 1
International money market instruments, amount outstanding (Mar. 2014)
(In USD billions)

Currency	Commercial Paper	Other Instruments
USD	194.7	132.4
EUR	178.4	142.7
JPY	1.5	0.6
GBP	107.1	81.9
AUD	3.5	1.8
CHF	3.8	3.4
Other Currencies	24.8	20.3

Source: Bank for International Settlements (BIS).

TABLE 2
Currency distribution of global foreign exchange market turnover (Mar. 2014)

Currency	Share (%)	Rank
USD	87.0	1
EUR	33.4	2
JPY	23.0	3
GBP	11.8	4
AUD	8.6	5
CHF	5.2	6
CAD	4.6	7
MXN	2.5	8
CNY	2.2	9
NZD	2.0	10

Source: Bank for International Settlements (BIS).

Most emerging and developing economies fail to fulfil the necessary criteria to internationalise their currencies. To reduce dependence on the dollar and diversify risks, alternatives could be developed through enhanced and sustainable forms of financial integration between the five BRICS economies.

The Standing Drawing Right (SDR) is an international reserve asset created by the IMF in 1969 to supplement member countries' official reserves. Its value is a weighted average of four international currencies – US dollar (41.9 per cent),

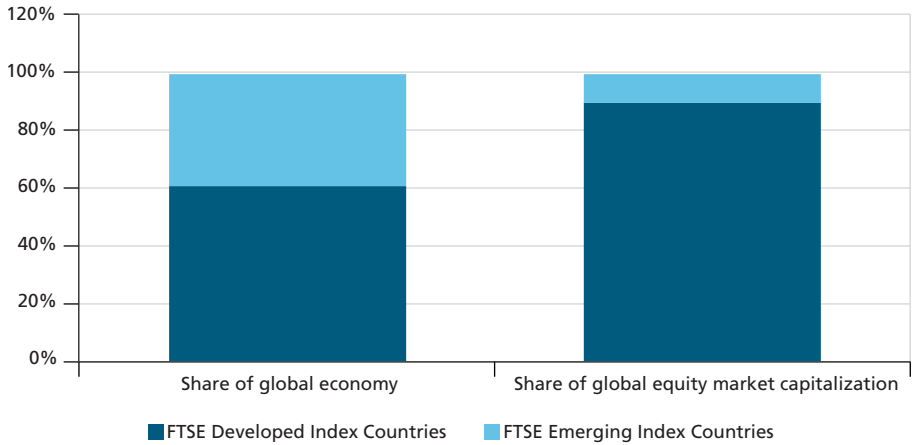
Euro (37.4 per cent), pound sterling (11.3 per cent) and Japanese yen (9.4 per cent) (IMF, 2010a) – based on each of their shares in international exports and "free use" of their currencies as determined by the IMF Executive Board. Although the SDR is not a true currency that can be traded on private markets, it can be exchanged for another country's foreign reserves and also used in official transactions with the IMF and other international organisations.

The SDR can function as a reserve pooling arrangement (Obstfeld, 2011). This sort of arrangement – especially one with a more diversified SDR basket – can bring stability to the global financial system. Another way to broaden the role of SDRs could be the issuance of SDR-denominated bonds, which would reduce emerging and developing economies' reliance on US treasuries.

At the onset of the financial crisis in December 2007, the Federal Reserve established reciprocal currency arrangements or "swap lines" with the various central banks. These swap lines were intended to ease short-term funding pressures by increasing the capacity of the partner central banks to directly fund US dollars to financial institutions in their jurisdictions. This facility, among others, helped in reducing overseas funding pressures and thus proved an effective liquidity backstop during the global financial crisis. BRICS could replicate such arrangements to pre-empt future liquidity crises. The People's Bank of China has entered into bilateral currency swap lines with around 25 global central banks (Shotter, 2014), including Russia and Brazil.

Between 2008 and 2013, emerging and developing economies contributed to approximately 80 per cent of the world's economic growth. However, their financial markets are still at a nascent stage – the market capitalisation of the listed companies within such economies is only 10 per cent of the global equity market capitalisation.

FIGURE 5
Economic growth and financial development (2013)

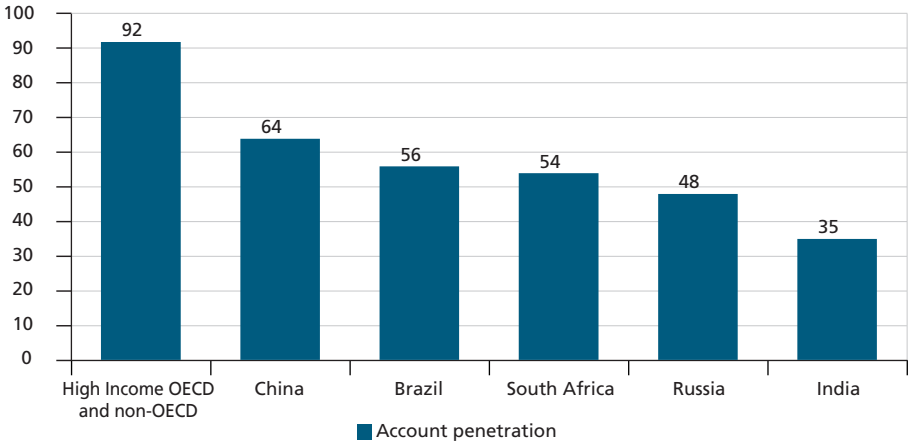


Source: vanguard.

At the same time, emerging and developing economies have historically maintained a significantly higher savings rate than advanced economies. The average of gross savings as a percentage of GDP among the BRICS countries has been close to 30 per cent over the past seven years (although with significant differences among them), whereas the average among countries of the Organisation for Economic Co-operation and Development (OECD) has hovered around 20 per cent.

Financial inclusion is still at an early phase within most of the BRICS countries. As seen in figure 6, nearly half of the adult population within these economies lacks access to an account at a formal financial institution. According to the Global Findex Database of the World Bank, about 17 per cent of the adults reported saving at a formal financial institution in the previous year.

FIGURE 6
Adults with an account at a formal financial institution (2011)
(In %)



Source: Global Financial Inclusion Database, World Bank.

With a combined market capitalisation of USD 7.5 trillion, the national stock exchanges within BRICS provide a useful template for financial market integration as well. The BRICS Exchange Alliance, established in March 2011, was a step in the right direction that allowed the respective exchanges to cross-list benchmark equity index derivatives on each other's platforms. To strengthen financial market integration, the role of the Exchange Alliance can be further deepened to allow cross-listing of individual securities. Similar proposals to integrate a commodity derivatives exchange, deepen the corporate bond market and incentivise infrastructure financing could go a long way in achieving the twin objectives of economic growth and financial stability.

Owing to the economic circumstances described in the previous section, BRICS has a strong incentive to design a range of institutional mechanisms to supplement efforts to ensure macro-prudential stability.

In particular, the motivation for a mechanism to rate financial instruments and sovereign risk is strong when seen in the context of the global rating agencies, which exhibited collective failure during the sub-prime mortgage crisis in the US economy. The agencies failed to acknowledge the underlying risk in complex financial securities. The US Securities and Exchange Commission has recently sought to suspend the credit grading operations of one of the three largest global credit rating agencies (Robinson and Michaels, 2014).

2.2 Reform of the Bretton Woods Institutions

2.2.1 The IMF and the World Bank

The IMF and the World Bank were created at an international conference convened in Bretton Woods, New Hampshire, USA, in July 1944. The goal of the conference was to establish a framework for economic cooperation and development that would lead to a more stable and prosperous global economy. While this goal remains central to both institutions, their mandate is constantly evolving in response to new economic developments and challenges.

BOARD 1
The IMF and the World Bank

The IMF's mandate: The IMF promotes international monetary cooperation and provides policy advice and technical assistance to help countries build and maintain strong economies. It also makes loans and helps countries design policy programmes to solve balance-of-payments problems when sufficient financing on affordable terms cannot be obtained to meet net international payments.

The World Bank's mandate: The World Bank promotes long-term economic development and poverty reduction by providing technical and financial support to help countries reform particular sectors or implement specific projects and policies –for example, building schools and health centres, providing water and electricity, fighting disease, and protecting the environment. World Bank assistance, through the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA), is generally long term and is funded both by member-country contributions and through bond issuance.

Source: IMF and World Bank.

The World Bank and the IMF have many similarities – both have headquarters in Washington DC and are owned by the governments of member nations. While the World Bank is primarily a development institution, the IMF acts to promote cooperation on monetary issues, as a policy adviser and as a crisis lender when countries face balance-of-payments problems.

The two organisations differ in size and structure. The IMF has about 2,300 staff members including economists and financial experts, and has no affiliates or subsidiaries. In addition to the headquarters, three small offices are maintained in Paris, Geneva and at the United Nations in New York. The World Bank – about three times the size of the IMF – has over 7,000 staff members with a range of

expertise, and maintains about 40 offices throughout the world. It comprises two major organisations: the International Bank for Reconstruction and Development (IBRD), the original lending arm that is operated for the benefit of 188 member countries, and the International Development Association (IDA), which assists the 82 poorest member countries. Specialised agencies such as the International Finance Corporation (IFC), the International Centre for Settlement of Investment Disputes (ICSID) and the Multilateral Investment Guarantee Agency (MIGA) are also under the aegis of the overall World Bank Group.

TABLE 3
Structure of the World Bank

	IBRD	IDA	IFC	MIGA	ICSID
Recipients	Middle-income member countries and creditworthy poorer countries	Poorest member countries	Private companies in member countries	Foreign investors in member countries	Foreign investors in member countries
Products/ Assistance	Technical assistance, loans, policy advice	Technical assistance, concessional loans, policy advice	Equity, long-term loans, risk management, advisory services	Political risk insurance	Dispute settlement facilities
Interest Rates/ Risk Premiums	6-month LIBOR + fixed/variable spread	Nil or 1.25% or 2.80% depending on the borrowing country's creditworthiness	Variable/Fixed Rate Loans pegged to local reference rates (short-term interbank rate or government securities rate)	Insurance premium depends on project/ country risk. Fees average 1% of the insured amount	-
Lending Commitments (FY 13)	$15.2 billion	$16.3 billion (credits and grants)	$11.2 billion (loans and equity investments)	-	-

Source: IBRD Annual Reports.

To finance its operations, the IMF has approximately USD 379 billion (as of August 2014) via quota subscriptions or membership fees paid in by 188 member countries, each of which contributes a certain amount of money according to a formula defined at the inception of the IMF in 1945.

The World Bank acts as an intermediary between sovereign investors and a range of recipients. With subscribed capital of USD 223.2 billion,[3] the IBRD borrows funds through issuance of "triple A"-rated bonds on secondary markets as well as directly to governments. The IDA obtains its resources mainly through grants from donor nations.

3. Paid-in capital: USD13.4 billion; callable capital: USD209.8 billion.

Each IMF member country is assigned a quota based on a formula that is supposed to reflect its relative position in the global economy. The current quota formula is a weighted average of GDP (50 per cent, of which 60 per cent at market exchange rates and 40 per cent at purchasing power parity (PPP)), openness (30 per cent), economic variability (15 per cent) and international reserves (5 per cent). The formula also includes a compression factor, limiting dispersion in calculated quota shares. A member country's quota determines its maximum financial commitment to the IMF and its voting power, and in addition has a bearing on its access to IMF financing.

IMF members must pay their subscription in full upon joining the Fund – up to 25 per cent must be paid in SDRs or currencies which constitute the SDR, while the rest is paid in the member's own currency. Each IMF member's votes comprise basic votes plus one additional vote for each SDR 100,000 of quota. The total number of basic votes[4] is fixed at 5.502 per cent of total votes. The voting share, in turn, determines the amount of financing (credit limit) a member can obtain from the IMF. For example, under IMF's Stand-By and Extended Arrangements, a member can borrow up to 200 per cent of its quota annually and up to 600 per cent cumulatively.

At the Bretton Woods conference global leaders were mainly engaged in discussing a stable international exchange rate regime and creating a structure for the IMF to prevent balance-of-payments crises. The World Bank, considered by some as an afterthought, was designed for the post-war reconstruction of Europe and specific projects in the developing world (Peet, 2003). Consequently, the IMF governance framework was used as a template to design voting structures in the World Bank. Member countries are allocated votes at the time of membership and subsequently for additional subscriptions to capital. Similar to the IMF, each member receives votes consisting of share votes (one vote for each share of the Bank's capital stock held by the member) plus basic votes, also fixed at 5.55 per cent of the total votes.

2.2.2 The imperative of reform

At the most recent 6th BRICS Summit at Fortaleza, the leaders' declaration read: "We remain disappointed and seriously concerned with the current non-implementation of the 2010 International Monetary Fund (IMF) reforms, which negatively impacts on the IMF's legitimacy, credibility and effectiveness" (BRICS, 2014).

4. IMF Articles of Agreement, Article XII, Section 5: "The basic votes of each member shall be the number of votes that results from the equal distribution among all the members of 5.502 percent of the aggregate sum of the total voting power of all the members, provided that there shall be no fractional basic votes."

As a result of the increasing demands for reforms following the financial crisis, the 14th General Review of Quotas was concluded in December 2010. This included proposals for wide-ranging reforms to reflect the increasing importance of emerging economies that were further approved by other G20 finance ministers and central bank governors at a meeting in 2010 in Gyeongju, Korea (IMF, 2010b). Despite proposals from multiple stakeholders, ratification by the US Congress is a significant hurdle in the actual implementation of reforms.[5] As of October 2014, the USA has the majority voting share of 17.69 per cent at the IMF and 16.07 per cent at the World Bank. To be fully implemented, the reform package will require approval by three fifths of the members, representing 85 per cent of the total voting power. The 85 per cent supermajority rule implies that the US must be a member of any winning majority, assuring it a unilateral veto. In January 2014, the US Congress failed to ratify the IMF reforms, undermining the implicit understanding between the G20 leaders. However, even if the reforms are passed, the US voting share will still be 16.5 per cent and will not eliminate this systemic dependence.

TABLE 4
Voting shares at the IMF before and after implementation of reforms agreed in 2008 and 2010

	As of March 2011	Post-2008 reform	Post-2010 reform
Advanced economies	59.5	57.9	55.2
Major advanced economies (G7)	44.3	43.0	41.2
United States	16.7	16.7	16.5
Other	27.6	26.3	24.7
Other advanced economies	15.2	14.9	14.0
Emerging market and developing countries	40.5	42.1	44.8
Developing countries	32.9	34.5	37.1
Africa	5.9	6.2	5.7
Asia	11.6	12.8	16.1
Middle East, Malta and Turkey	7.6	7.3	6.8
Western Hemisphere	7.8	8.2	8.4
Transition economies	7.6	7.6	7.7
Total	**100**	**100**	**100**

Source: IMF, IMF Members' Quotas and Voting Power, and IMF Board of Governors, 16 Dec. 2014.

5. In the 2014 spring meetings of the IMF and the World Bank, finance ministers and central bank governors of the G20 indicated that if the 2010 reforms are not ratified by year-end, they will move forward with the reforms without the USA.

Although the capital structure and voting rights have been amended at both the World Bank and the IMF, voting power is still skewed towards advanced economies.

BRICS countries, accounting for more than a fifth of global output, have a mere 10.3 per cent share of the total allocated quota. European Union (EU) countries, by contrast, are allocated 32 per cent as against 21 per cent of output (The Economist, 2011). In the World Bank, high-income, non-borrowing countries hold more than 60 per cent of the total voting power.

TABLE 5
Voting shares of selected countries at the IMF and IBRD, as of 24 Oct. 2014

Voting Share (%)	IBRD	IMF
United States	16.07	17.69
Japan	8.02	6.56
Germany	4.50	6.12
France	4.01	4.51
United Kingdom	4.01	4.51
BRICS	13.46	11.51

Source: IMF, World Bank.

The proposed reforms will lead to a realignment of voting shares – more than 6 per cent of quota shares will shift to dynamic emerging and developing economies, and the BRICS (except South Africa) will be among the 10 largest shareholders.

Under the IMF Articles of Agreement, each of the five members with the largest quotas appoints an Executive Director, and the remaining members elect other Executive Board members. Presently, the IMF Executive Board consists of 24 Executive Directors presided over by the Managing Director.

The World Bank follows a similar governance structure. For instance, under the IBRD Articles of Agreement, each of the five members with the largest number of shares appoints an Executive Director, and the remaining members elect the other Executive Directors. Presently, the IBRD Board of Directors consists of 25 Executive Directors presided over by the President.

The inequitable distribution of voting power is reflected in the number of countries represented by each Executive Director. Large shareholding member nations have their own representative on the Executive Board, whereas many smaller members are grouped into constituencies representing four or more countries. For instance, 45 countries in sub-Saharan Africa are grouped into just two constituencies and represented by only two Executive Directors.

Moreover, all past Presidents of the World Bank have been US citizens, while the past Managing Directors of the IMF have all been Europeans. This sort of representational inequity only serves to detract from the efficacy of the Bretton Woods Institutions. The 2010 reforms seek to redesign the Executive Board by electing members instead of appointing them. Moreover, advanced European countries should reduce their combined board representation by two chairs.

2.2.3 Enabling efficient resource allocation and transparent decision-making

The IBRD and the IDA collectively loaned about USD 40 billion in 2013-14. Out of this, total spending on infrastructure including energy, transportation, water, sanitation and health amounted to USD 13.8 billion (World Bank, 2014). However, this amount is grossly inadequate when seen in the context of the development needs of emerging and developing economies. It is estimated that infrastructure requirement in BRICS countries are well over of USD 1 trillion.

In addition to quota reserves, the IMF has a supplemental fund of resources called the New Arrangements to Borrow (NAB) – a temporary credit arrangement between the IMF and 38 member countries – worth approximately USD 588 billion. On top of this, in 2012, as economic and financial conditions worsened in Europe, 38 countries committed to IMF resources further by bilateral borrowing agreements, totalling USD 461 billion, of which 32 are effective as of August 2014, totalling USD 425 billion. The IMF has had to resort to the NAB on multiple occasions in the recent past. This has demonstrated the inadequacy of the quota reserves; especially on occasions when a collective response was required (the proposed 2010 reforms aim to double the quota reserves to about USD 750 billion). Before the 2012 G20 Summit in Los Cabos, BRICS leaders collectively pledged USD 75 billion to the IMF's bailout fund for the Eurozone debt crisis (The Times of India, 2012).

There is also a crucial need for directing the resources of the Bretton Woods Institutions towards the sectors that can directly address the attendant challenges of emerging and developing economies. The World Bank declared that it will avoid funding towards the coal sector in 2013.[6] This is in direct conflict with the development priorities of many emerging and developing economies. For instance, coal-fired thermal power accounts for 60 per cent of India's total power generation, which makes it systemically important for economic growth (Central Electricity Authority, India).

6. "The WBG will provide financial support for greenfield coal power generation projects only in rare circumstances. Considerations such as meeting basic energy needs in countries with no feasible alternatives to coal and a lack of financing for coal power would define such rare cases" (World Bank, 2013).

Similarly, the IMF has a mandate to ensure global financial stability. However, when providing funds during crises, the strict conditionalities it often imposes can have adverse impacts on long-term growth. Countries such as Indonesia, Republic of Korea and Thailand were forced to adopt strict structural adjustment policies in exchange for IMF bailouts during the East Asian crisis in 1997. More recently, the G77 and China have called for more flexible financial responses to the needs of member countries without the imposition of pro-cyclical conditionalities (Group of 77 and China, 2010).

2.3 The New BRICS Development Bank

At the 2014 BRICS Summit at Fortaleza, the BRICS countries signed an agreement on establishing a New Development Bank (NDB), "with the purpose of mobilizing resources for infrastructure and sustainable development projects in BRICS and other emerging and developing economies" (BRICS, 2014).

Infrastructure financing still remains a significant hurdle in the development of many emerging and developing economies and is a clear priority for members of BRICS. For instance, within BRICS the averages of key development indicators such as per capita electricity consumption (3502 kwh), fixed broadband internet subscribers (8.9 per cent), total rail lines (53,065 km) and paved roads (51 per cent) compare poorly with developed countries.

The lack of a regular supply of infrastructure such as power and running water impedes economic growth. In fact, infrastructure deficits have proved to be a primary constraint for businesses in emerging and developing economies – between 3 and 10 per cent of total sales were lost to electricity outages in developing countries in the latest available year of the 1994-2004 period (MDB Working Group on Infrastructure, 2011). The reliability of infrastructure and the maintenance of existing infrastructure is also a challenge that BRICS countries collectively face – and perhaps there is room for the NDB's financing mandate to cover this core development concern.

While infrastructure development is a widely acknowledged 'hard development' challenge within BRICS, the key challenges within 'sustainable development' are more nuanced and context specific. Perhaps distinctly divergent from the position taken by advanced economies, BRICS countries have repeatedly stressed poverty reduction and inclusive growth as the prerequisite to sustainable development. Indeed, a common position within these economies has been to "take eradicating poverty and promoting development as the centre-piece of the Development Agenda beyond 2015" (People's Republic of China, 2013), as well as collectively "addressing the challenges of poverty and inequality" (BRICS, 2014). This is not surprising, as human development indicators within BRICS countries continue to lag behind developed economies. Chapter 3 provides closer discussion of social indicators.

To address the above-mentioned development challenges, it is important to make economic growth a priority task, and advance economic, social and environmental development in a comprehensive and coordinated manner. In this context, the NDB's sustainable development linked financing mandate should not only focus on environmental sustainable projects such as environmental protection and improvement, renewable energy, circulator economy, but also focus on supportive project of reducing inequality, improving inclusion and enhancing social and human development. Given the current state of infrastructure and the overarching objective of sustainable development, capacity building in the relevant sectors should be the utmost priority of the NDB. According to estimates by the MDB Working Group on Infrastructure,[7] the weighted average of infrastructure investment will need to be roughly 7 per cent of the respective country GDPs (table 6). This figure, however, is likely to be much higher for BRICS countries.

TABLE 6
Projected infrastructure investment, percentage of GDP

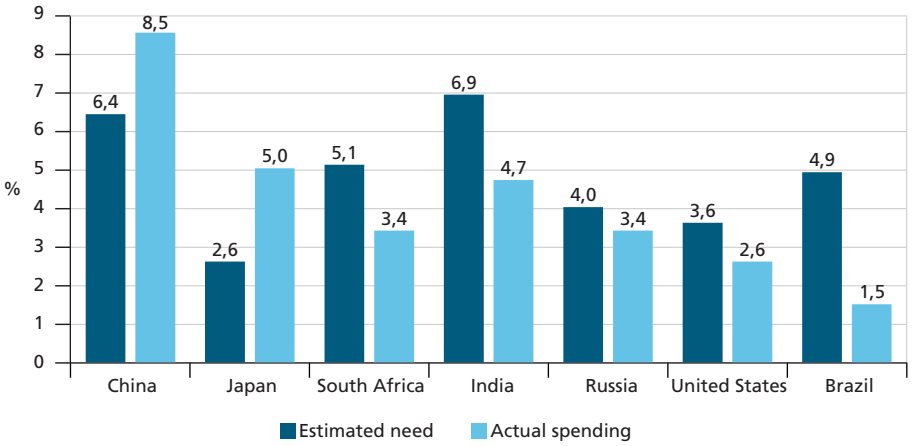
Regions	Need (average annual 2010-2020)		Estimated actual spending
	USD billion, 2005 constant	% of projected GDP	
East Asia and Pacific	408	5.5	207
Central Asia	13	5.2	NA
Eastern Europe	NA	NA	NA
Latin America and the Caribbean	81	2.6	44
Middle East and North Africa	75–100	10.0	44
South Asia	191	10.8	46
Sub-Saharan Africa	93	9.8	45
Weighted Average	-	7.2	-

Source: MDB Working Group on Infrastructure, 2011. Supporting infrastructure in developing countries, submission to the G20.

According to more conservative estimates by the McKinsey Global Institute (2013), the value of infrastructure stock – the sum total of fixed assets of an economy – averages around 70 per cent of the GDP in most economies. To maintain this ratio, developing regions will need to allocate 5.6 per cent of GDP towards infrastructure investment up to 2030. Specifically, BRICS countries require an average infrastructure investment totalling 5.5 per cent of their respective GDP, while the figure for the USA stands at 3.6 per cent and for Japan 2.6 per cent (figure 7). Notably, within BRICS only China's infrastructure investment exceeds its total needs.

7. Comprising the African Development Bank, Asian Development Bank, European Investment Bank, Inter-American Development Bank, Islamic Development Bank and the World Bank Group.

FIGURE 7
Infrastructure spending, percentage of GDP
(In %)



Source: McKinsey Global Institute, infrastructure productivity: how to save $1 trillion a year, Jan. 2013.

The Articles of Agreement of the NDB proposes to complement "the existing efforts of multilateral and regional financial institutions for global growth and development" and "support public or private projects through loans, guarantees, equity participation and other financial instruments". It also underlines the need to "cooperate with international organizations and other financial entities, and provide technical assistance". It may be noted that in this context the involvement of international organisations and private stakeholders may enable large capital infusion at times of contingency, and provide specific experience and expertise for NDB's operations.

Similar to existing models at the Asian Development Bank and the African Development Bank (table 7), the NDB's capital will comprise both Ordinary Capital and a Special Fund, both to be governed by specific terms and conditions including repayment of principle and interest charges. Special Funds could earmark projects aimed at building infrastructure networks such as ports, roads and highways, to promote regional economic integration.

TABLE 7
Means of financing – existing MDBs

MDB	Arm	Type of financing	Commitments in FY 2013 (USD billions)
World Bank	IBRD	Non-concessional loans and loan guarantees	15.2
	IDA	Concessional loans and grants	16.3
	IFC	Non-concessional loans, equity investments and loan guarantees	18.3

(Continues)

(Continued)

MDB	Arm	Type of financing	Commitments in FY 2013 (USD billions)
African Development Bank	AfDB	Non-concessional loans, equity investments and loan guarantees	2.7
	AfDf	Concessional loans and grants	3.4
	NTF	Concessional loans and grants	0.1
Asian Development Bank	ADB	Non-concessional loans, equity investments and loan guarantees	11.9
	ADF	Concessional loans and grants	4.5
European Bank for Reconstruction and Development	EBRD	Non-concessional loans, equity investments and loan guarantees	11.2
Inter-American Development Bank	IDB	Non-concessional loans and loan guarantees	13.2
	FSO	Concessional loans	0.3

Source: Annual Reports – World Bank, ADB, EBRD, IADB.

The NDB Articles of Agreement also allow the option of financing certain projects in local currencies. Such instruments can offer safe investment alternatives in shallow bond markets. For instance, the IFC raised bonds denominated in Indian rupees worth USD 2 billion in August 2013 to finance infrastructure projects (Kumar, 2014). In the context of the NDB, modalities of local bond issues in nascent capital markets must be developed in conjunction with retail investor awareness and education programmes.

For non-concessional finance, the Articles of Agreement use a ratio of 1:5 between paid-in and callable capital, similar to other MDBs. This gives the NDB the leverage to finance projects worth USD 50 billion for every USD 10 billion actually disbursed.

The NDB must be able to fulfil an ambitious and expansive development mandate. While financing transformations within infrastructure and sustainable development sectors in developing countries is already established as the operational mandate, a set of well-articulated development principles would help to distinguish the directional and definitional aspects of the NDB's mandate.

The global development discourse has largely been driven by institutions that were formed in the 20th century, and does not reflect contemporary realities. For instance, the only development "consensus" today seems to be that the "Washington Consensus", which stressed the maximisation of the role of the market and minimisation of the role of governments in developing countries, is not in fact a panacea for global development deficits.

The NDB could follow a demand-driven approach to financing which would place the onus of identification of viable projects for financing on recipient governments. This process is already being followed within many development

financing institutions of BRICS countries and is seen to be a pillar of mutually beneficial cooperation. Particular emphasis would have to be maintained on the transparency of demand origination, as well as the assessment process followed by the NDB's executive branches for deciding on funding commitments towards various stakeholders.

The NDB could conduct thorough assessments of various domestic economic and political contexts of recipient countries. A "one-size-fits-all" development approach has not been successful; this is evidenced by the variable levels of progress by developing countries on the Millennium Development Goals. Structural considerations have often limited the flows of development financing, particularly in the case of funding flows routed through existing Bretton Woods Institutions towards developing countries. The macroeconomic fundamentals of different countries should not be assessed through a static framework of reference but, instead, through a dynamic and to some extent qualitative assessment, particularly within the specific sectors that are being considered for financing.

Developing countries have a shared challenge of building up domestic institutional capacities to enhance development. The efficacy of development finance cannot be ensured without commensurate focus on capacity-building. Indeed, capacity-building in many instances would be a prerequisite to aspects such as "good governance" or the effective utilisation of financial flows towards specific projects. The NDB could support existing domestic capacities for project management and implementation, as well as institutions which can facilitate the measurement of developmental impact in recipient countries.

A Technical Evaluation Group should be set up within the NDB, tasked with: *i*) monitoring and assessment of projects and audit functions; *ii*) supervision of financial and non-financial risks; and *iii*) advisory support towards projects.

2.4 Coordination in multilateral institutions

As BRICS assumes a pivotal role in the global governance architecture, it has to strive towards affecting structural changes within existing multilateral institutions, to promote effective governance, inclusiveness and transparency. The BRICS countries must be propositional and share relevant governance experiences with each other to further this central objective.

2.4.1 United Nations Security Council

The primary role of the United Nations Security Council (UNSC) is maintaining international peace and security through peaceful dispute settlement or, in some cases, the imposition of sanctions and authorisation of the use of force. The UNSC also recommends candidates for the role of Secretary-General of the

UN and nominates new member nations; together with the General Assembly, it elects the judges of the International Court of Justice.

The UNSC comprises 15 members – five permanent members with veto powers (the P-5: China, France, Russian Federation, the United Kingdom and the United States) and 10 non-permanent members with ordinary voting powers, elected for two-year terms by the General Assembly (currently: Angola, Chad, Chile, Jordan, Lithuania, Malaysia, New Zealand, Nigeria, Spain and Venezuela). The voting pattern of the important UNSC resolutions in the last five years is highlighted in table 8.

Discussions on UNSC reform have been multifaceted – including areas such as increasing overall membership, improving efficiency and streamlining processes. A well-established motivation for reforms includes the steady growth in UN membership from 51 to 193 members. Moreover, the growing economic and political prominence of emerging and developing economies, such as Brazil and India, has highlighted the need for broader representation (table 8).

TABLE 8
P-5 vs. G-4 (2013)[1]

	Population (millions)	GDP (current USD billions)	Peacekeeping troops	UN funding (% of total funding)	Defence budget (USD billions)
Brazil	200 (5)	2245 (7)	1685 (21)	2.93% (10)	34.7 (10)
India	1252 (2)	1876 (10)	8104 (2)	0.66% (27)	36.3 (9)
Japan	127 (10)	4901 (3)	271 (46)	10.83% (2)	51.0 (7)
Germany	80 (16)	3634 (4)	204 (52)	7.14% (3)	44.2 (8)
China	1357 (1)	9240 (2)	2192 (14)	5.15% (6)	112.2 (2)
Russia	143 (9)	2096 (8)	91 (67)	2.44% (11)	68.2 (3)
France	66 (21)	2735 (5)	933 (27)	5.59% (4)	52.4 (6)
UK	64 (22)	2522 (6)	287 (45)	5.17% (5)	57.0 (5)
USA	316 (3)	16800 (1)	117 (62)	22% (1)	600.4 (1)

Sources: World Bank Data, UN Peacekeeping, International Institute for Strategic Studies.
Note: [1] 2013 or most recently available.

Although reform of the UNSC has been on the UN agenda since 1993, the status quo remains. Different groupings such as the G-4 (Brazil, India, Japan and Germany), the UFC (United for Consensus: Argentina, Canada, Colombia, Costa Rica, Italy, Malta, Mexico, Pakistan, Republic of Korea, San Marino, Spain, Turkey) and the African Union have proposed varied solutions.

Changes to the UNSC membership can only be affected via amendments to the UN Charter. These amendments must be ratified by a two-thirds supermajority of the UN as well as the mandatory consent of each of the P-5 countries.

To be effective, it is imperative that BRICS countries articulate a collective voice on issues of global importance. At the Fortaleza Summit they highlighted "the need for a comprehensive reform of the UN, including its Security Council", and China and Russia reiterated "the importance they attach to Brazil, India and South Africa's status and role in international affairs and support[ed] their aspiration to play a greater role in the UN" (BRICS, 2014). BRICS countries should consistently take a clear position on substantive reforms, both within the BRICS forum and outside it.

2.4.2 United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty, ratified by 196 countries, to respond to global warming and climate change. The Convention was adopted at the Rio Earth Summit in 1992, and negotiations were launched in 1995 to strengthen the global response to climate change. Since then, the Conference of Parties (COP) – the governing body of the UNFCCC – has been convening annually to assess the progress on the overall objectives. There have been 19 COPs, and some of the prominent outcomes/agreements are highlighted in table 9.

TABLE 9
Notable COPs and outcomes

Year	Location	Agreement/Outcome
1997	Kyoto	Kyoto Protocol
2001	Bonn	Design of flexible mechanisms such as emissions trading, joint implementation, Clean Development Mechanism
2001	Marrakech	Detailed rules for implementation of the Kyoto Protocol
2005	Montreal	Montreal Action Plan to extend the Kyoto Protocol
2007	Bali	Bali Action Plan – negotiation of a post-2012 framework
2009	Copenhagen	Copenhagen Accord negotiated by 25 countries including the USA and China; countries submitted non-binding pledges
2010	Cancun	Agreement on a USD100 billion per annum Green Climate Fund and a Climate Technology Centre
2011	Durban	Durban Platform for Enhanced Action
2012	Doha	A new commitment period under the Kyoto Protocol for Annex-I Parties up to December 2020
2013	Warsaw	Warsaw Framework for Reducing Emissions from Deforestation and Forest Degradation (REDD) Plus

Source: UNFCCC. Background on the UNFCCC: the international response to climate change. Available at: <http://goo.gl/og2cwO>. Accessed: 1 Oct. 2014.

At COP15 in Copenhagen four members of BRICS – India, China, Brazil and South Africa – formed the "BASIC" grouping. Since then, members of BASIC have been meeting on the side-lines of climate change negotiations. Such close cooperation efforts are indicative of the potential of BRICS nations to address climate change in accordance with historical responsibilities, current capacities and on key

common issues of concern including finance, technology and capacity-building.[8] The imperative for greater interest-based coordination within BRICS is exemplified by the fact that the BASIC countries – generating over 15 per cent of global GDP and over 25 per cent of greenhouse gas emissions by 2009 – are regarded as having a decisive voice in international negotiations (Qi, 2011). Intra-BRICS coordination on climate change issues also extends beyond the multilateral framework, particularly around key concerns such as energy access and energy efficiency (table 10).

TABLE 10
Key energy metrics

Country/Grouping	Energy access (electrification – % of population, 2005–2009)	Energy intensity (koe/$0.5p, 2009)	Energy consumption per capita (million btu, 2009)
OECD	100	0.15	187.850
Brazil	93	0.13	53.735
Russia	100	0.32	188.464
India	75	0.20	18.710
China	100	0.28	65.731
South Africa	66	0.31	114.437

Source: World Bank Data.

BRICS must move towards knowledge transfer for "shared prosperity", based on the joint development and distribution of a range of technologies. In this context, China's experience with both renewable energy and energy efficiency might provide a valuable learning opportunity. Additionally, Brazil already obtains much of its energy from sugar-based ethanol, specifically in its transportation sector. India has a comprehensive policy framework in place for enabling greater investments and focus on the renewable and energy efficiency sectors, as well as progressive market-based efficiency initiatives. South Africa has also put in place various corporate governance and sustainability norms to govern large corporate entities and enable a sustainable growth trajectory. These are positive examples. Energy conservation through green buildings is also an additional area on which BRICS can focus.

A key trend going forward will be the onset of major effects from climate change – including variability of rainfall patterns, disruption of hot and cold weather cycles, and others. The challenges presented by shifting climate patterns will disproportionately affect developing countries, which have comparably few resources to adequately address them. BRICS countries dependent on agriculture will be particularly vulnerable to climate variability. BRICS countries are also home to some of the world's most valuable regions of biodiversity, which are vulnerable to temperature rises.

8. Similar example of joint efforts, in this case to deal with security issues, is the Shanghai Cooperation Organization.

2.4.3 World Trade Organization

The World Trade Organization (WTO), operationalised on 1 January 1995, is a "rules-based" organisation that provides a negotiating forum for trade liberalisation through multilateral agreements and trade dispute settlement. The WTO has grown from its 128 original members to 160 countries as of September 2014, with an additional 24 countries having applied to accede (WTO, 2015).

TABLE 11
BRICS membership of WTO/GATT

Country	WTO membership date	GATT membership date
Brazil	1 January 1995	30 July 1948
Russia	22 August 2012	-
India	1 January 1995	8 July 1948
China	11 December 2001	-
South Africa	1 January 1995	13 June 1948

Source: WTO. Understanding the WTO: the organization – members and observers. Available at: <http://goo.gl/ODLDOO>. Accessed: 26 June 2014.

Past WTO negotiating rounds have displayed fundamental asymmetries in the negotiation position of developed and developing countries. The fact that developed countries account for a large share of world trade (for instance, just the USA and the EU account for 38 per cent of imports and 23 per cent of exports) gives them considerable bargaining power. Apart from having similar levels of per capita income, these countries also often exhibit a tendency for collective bargaining in international negotiations. In contrast, groupings of emerging and developing countries are often fragmented. BRICS nations would do well to be able to rally emerging and developing economies together for effective collective bargaining. For instance, the applied tariff rates within developing countries and BRICS are significantly lower than the bound rates (table 12).

TABLE 12
Bound and applied tariff rates (2014)

Countries	Non-agriculture tariff rates		Agriculture tariff rates	
	Bound	Applied	Bound	Applied
China	9.1	8.7	15.8	15.6
India	34.5	10.4	113.1	33.5
Brazil	30.8	14.1	35.4	10.1
Russia	7.2	9.4	11.2	13.3
South Africa	15.8	7.4	39.6	8.4
USA	3.3	3.2	4.7	4.7
EU	3.9	4.2	13.7	13.2
Japan	2.6	2.6	22.1	16.6

Source: WTO statistics database.

There is also significant disparity between developed and developing countries in terms of research capacities for strategic planning and knowledge generation. In addition to government bodies, developed countries also have a host of independent researchers, think tanks and private-sector interest groups which study intricate aspects of the negotiation process and the various agreements, to chart out favourable strategies

As an illustration of this, there has been significant research in developing countries on the relative merits and demerits of mega Free Trade Agreements (FTAs), such as the Trans-Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TTIP). While individual BRICS countries have deliberated on the possible implications of the emergence of mega FTAs, there has been little by way of a collective position or collective research on such issues. The central issue for the BRICS governments to consider in the context of both these agreements is the possible effects on non-member countries. Both agreements may undermine the export competitiveness of BRICS economies and set a new agenda for the international rules-based system on trade.

TABLE 13
Proposed mega FTAs

Trade agreement	Value of bilateral goods (USD billions, 2011 or latest)	Date negotiations launched
Trans-Pacific Partnership (TPP)	1492.2	June 2005
Transatlantic Trade and Investment Partnership (TTIP)	618.5	February 2013

Source: The economist. The other conclave. 16 Mar. 2013. Available at: <http://goo.gl/1CYh01>. Accessed: 17 Sept. 2014.

3 RECOMMENDATIONS

It is in the collective interest of BRICS member nations to work together with other economies that are part of the G20, to align policies and positions for an optimal outcome. In this context, some of the immediately relevant areas are highlighted below.

BRICS central banks should tailor regulatory frameworks and coordinate closely to engage in the global regulatory agenda-setting process.

The IMF lacks the functions of a central bank and is unable to create additional liquidity in the international monetary system by issuing new SDRs. Moreover, even if the IMF were able to expand its mandate, it is unlikely to receive the additional finances to compensate it for portfolio losses and exchange rate fluctuations. BRICS would strengthen cooperation to promote the inclusion of currencies of emerging market economies and developing countries that meet the current SDR criteria into the SDR currency basket, in order to improve the representativeness, stability and attractiveness of the SDR. BRICS would do well to strengthen coordination on flexible and robust currency arrangements.

There is substantial scope to develop the capital markets in BRICS economies by broadening the range of asset classes on offer to efficiently channel household savings. Expansion of capital markets should be the foremost priority for the market regulators. BRICS stakeholders can share their experiences to enable a robust financial market through greater investor participation, by creating the facilitating regulatory frameworks and innovative financial products that can be accessible to low-income classes.

BRICS should develop financial products that can target specific segments of the population, such as derivative products for farmers to provide agricultural insurance and innovative mutual funds for small-scale investment to develop small and medium enterprises (SMEs).

To prevent unforeseen asset bubbles, and be better prepared to respond to externalities in the global financial architecture, an independent BRICS rating agency could be set up. The objective would be to prevent a build-up of unsustainable corporate debt levels, maintain a check on banking assets, mitigate the negative effects of the largely unregulated shadow banking sector and maintain a watch on the performance of the global economy.

It is incumbent upon BRICS to assume a leadership role in the global political and economic governance and seek greater equity for the developing world. Meanwhile, BRICS countries remain ready to contribute to the improvement and reinforcement of the global financial architecture. Reform of the Bretton Woods Institutions is central to this objective.

BRICS would do well to maintain its efforts to achieve a comprehensive reform of the UN, including its Security Council.

BRICS should empower civil society to supplement the calls from various stakeholders for accelerated reforms within the Bretton Woods Institutions.

BRICS would do well to change the value-laden conditionality discourse through collective resolve and close collaborations complementing the international safety net with initiatives such as the Contingent Reserve Arrangement.

Together with huge investments in physical infrastructure, there also needs to be commensurate financing to ensure sustainable development. In particular, the performance of BRICS countries in several aspects of social sectors such as health and education lags behind developed countries. Focused funding should be directed towards capacity-building and efficient delivery of basic services.

Debt issuance in local capital markets can help avoid currency mismatch arising out of such project funding, and help to develop nascent capital markets in developing countries.

Provision for concessional lending should be developed for catering to development needs of Least Developed Countries (LDCs). This could take on the form of concessional lines of credit financed by partner countries and trust funds similar to the IDA. Such funds, however, should be prudently managed with a periodic review of the investment horizons and the risk–return profiles.

Given the large, urgent infrastructure financing deficits in emerging and developing countries, the NDB could look to incorporate private capital in the financing mix. This could be facilitated by incentives in the form of risk mitigation guarantees and partnerships. Preferred creditor status and a cover for credit risk and political risk could similarly incentivise private lending. In addition, a mechanism for evaluations on a project-to-project basis could be created to ensure transparency and accountability.

BRICS countries need to further their cross-region monetary cooperation and enhance CRA's effectiveness, supplementing the global financial safety net. There is a need to coordinate interests on adaptation at the UNFCCC (particularly on finance and technology requirements for developing countries to adapt to climate change). The Technology Mechanism established at COP16 at Cancun should be leveraged to enhance action on technology development and transfer, and a commensurate share of the resources of the Green Climate Fund should be channelled towards adaptation activities.

In international trade negotiations developed countries have focused on the bound rates and demanded drastic cuts, not easily facilitated given the domestic industrial competitiveness concerns in many developing economies. BRICS countries would do well to coordinate their positions within the WTO to withstand such pressures on the basis of existing and projected achievements and domestic viability.

Duty-free, quota-free market access is a crucial measure to help LDCs leverage the opportunities offered by the multilateral trading regime. Such policy initiatives by BRICS countries will only enhance economic cooperation and consolidate support at multilateral trade talks.

To confirm their commitment to having a stronger and rules-based multilateral trading system at the heart of world trade governance, the BRICS countries must aim to bring more transparency to regional agreements at the WTO.

One of the main results of the Uruguay round was the strengthening of the diplomatic–judicial pillar of the multilateral trading system with a robust dispute settlement mechanism – essential in reinforcing multilateral trade governance. The mechanism needs to be improved to reduce the costs and increase the benefits of participating in it, particularly for the poorest countries.

CHAPTER 3

SOCIAL JUSTICE, SUSTAINABLE DEVELOPMENT AND QUALITY OF LIFE

PILLAR

BRICS should aim to promote the improvement of living conditions through sustainable and inclusive economic growth and development for its citizens as well as the global citizenry. Such an agenda seeks to reduce inequalities, enable the creation of employment opportunities, and eradicate extreme poverty, whilst also unleashing the potential for innovation as a driver of change. In advancing employment creation programmes, member states are mindful that decent work and informal entrepreneurial opportunities could play a meaningful role in assisting poor people to escape the poverty trap.

1 CURRENT SITUATION

While the BRICS countries have managed to sustain considerable economic growth over the past decades, they continue to face significant challenges in ensuring social and economic justice at national and regional levels. The presence of high rates of inequality is a common challenge faced by all BRICS countries.

In pursuit of an agenda to exchange ideas and learn from one another on how to address extreme poverty, inequality, unemployment and protection of the vulnerable, the following focus areas are considered:

- social protection safety net programmes for all;
- education;
- health;
- migration, urbanisation and infrastructure; and
- climate change, ecological degradation and food insecurity.

Following from the Charter of the United Nations (UN) and the principle of social justice, all human beings should benefit from economic and social progress. Collectively BRICS has an opportunity to set the agenda for ensuring more equitable and just solutions for all. This is especially important in light of the impending conclusion of the Millennium Development Goals (MDGs) and negotiations around the post-2015 Sustainable Development Goals (SDGs).

In this regard BRICS member states identify common challenges, note existing successful cooperation and sharing initiatives, and submit recommendations to further promote cooperation among them in the above-mentioned focus areas.

1.1 Social protection

Following the adoption of the UN Millennium Declaration, the MDGs cover eight international development areas that were established after the UN Millennium Summit in 2000. All 189 UN members (there are 193 currently), including the BRICS countries, have started this endeavour since then, and at least 23 international organisations have committed to jointly achieve the following MDGs by 2015:

TABLE 1
Millennium development goals and measurements

Goal 1	Eradicate extreme poverty and hunger
Measurement	Employment to population ratio, 15 year+, total (%) (modelled ILO estimate)
Goal 2	Achieve universal primary education
Measurement	Primary completion rate, total (% of relevant age group)
Goal 3	Promote gender equality and empower women
Measurement	Proportion of seats held by women in national parliaments (%)
Goal 4	Reduce child mortality
Measurement	Mortality rate, under 5 (per 1000 live births)
Goal 5	Improve maternal health
Measurement	Maternal mortality ratio (modelled estimate, per 100,000 live births)
Goal 6	Combat HIV/AIDS, malaria and other diseases
Measurement	Prevalence of HIV, total (% of population aged 15-49)
Goal 7	Ensure environmental sustainability
Measurement	CO_2 emissions (metric tons per capita)
Goal 8	Develop a global partnership for development
Measurement	Internet users (per 100 people)

Data Source: World Bank, Data for Millennium Development Goals. For each goal, there are multiple measurements; the author selected one. Please see: <http://goo.gl/XgSakD>.

The achievements made by the BRICS countries are listed in table 2.

TABLE 2
Millennium development goals achievements by BRICS countries

	World		Brazil		Russia		India		China		South Africa	
	1990	2012	1990	2012	1990	2012	1990	2012	1990	2012	1990	2012
Goal 1	62	60	60	65	58	60	58	54	75	68	41	39
Goal 2	81	92	92	#	#	97	64	96	106	#	76	#
Goal 3	13	21	5	9	16	14	5	11	21	21	3	42
Goal 4	90	48	62	14	26	10	126	56	54	14	61	45
Goal 5	380	210	120	69	74	24	560	190	97	32	150	140

(Continues)

(Continued)

	World		Brazil		Russia		India		China		South Africa	
	1990	2012	1990	2012	1990	2012	1990	2012	1990	2012	1990	2012
Goal 6	0.3	0.8	#	#	#	#	0.1	0.3	#	#	0.2	17.9
Goal 7	4	5	1	2	14	12	1	2	2	6	9	9
Goal 8	0	35.6	0	48.6	0	63.8	0	12.6	0	42.3	0	41

Data Source: World Bank, Data for Millennium Development Goals, <http://goo.gl/T8WWCM>.
Obs.: 1. For unit of each goal in this table, please see table 1 for reference.
2. (#) non-available.

The BRICS countries have been firmly committed to achieving the MDGs, and their performance so far has been reasonably good. However, no member country has achieved all the goals or exceeded the world average level, which presents opportunities to deepen their cooperation in this area in the future. This has imposed the need for a renewed common set of goals for the coming years.

Despite varying degrees of economic development, all five BRICS countries have enjoyed significant and sustainable growth over the last two decades. For example, their average annual gross domestic product (GDP) growth of more than 8 per cent in the 2000s was significantly higher than growth in developed countries. Notwithstanding, BRICS member states, like many emerging markets and developing countries (EMDCs), continue to experience high levels of poverty, inequality and unemployment, which undermine the rights of citizens to social justice and a better quality of life. Table 3 shows that while all BRICS countries, except South Africa, increased employment following the 2008 financial crisis, they experienced a slowdown in employment between 2007 and 2012, with significant youth unemployment.

TABLE 3
National and youth unemployment trends, BRICS countries (2007, 2011 and 2012)

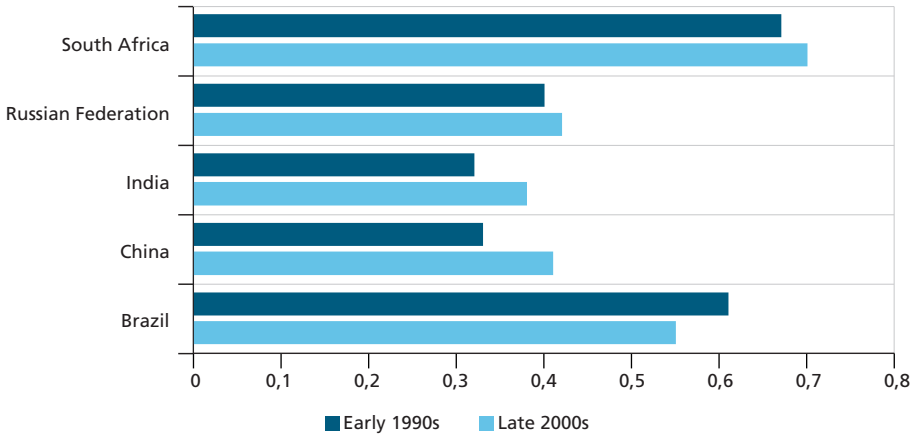
Country	National unemployment rate (%)	Youth unemployment rate (%)			Youth to adult unemployment ratio		
		2007	2011	2012	2007	2011	2012
Brazil	6.1 (2012)	16.8	15.4	--	2.7	2.3	--
China	5.5 (2013)	--	--	7.6	--	--	1.9
India	5.3 (2012/2013)	10.0[1]	--	10.7	2.3	--	3.2
Russia	4.1 (2013)	14.4	15.2	14.8	2.4	2.3	2.7
South Africa	25.1 (2012)	46.5	49.8	54.5	2.1	2.0	2.2

Source: IPC-IG (2014). Youth and employment among the BRICS.
Note: [1] 2005 data.

In terms of income inequality, Russia, India, China and South Africa experienced increasing levels of inequality over the last two decades. The OECD report *Economic Policy Reforms 2010* (see figure 1) shows that South Africa has the worst level of

inequality among the BRICS countries. While inequality decreased in Brazil, it is still notably high. Data for India show the lowest levels of inequality in the group, and the Russian Federation is in third place.

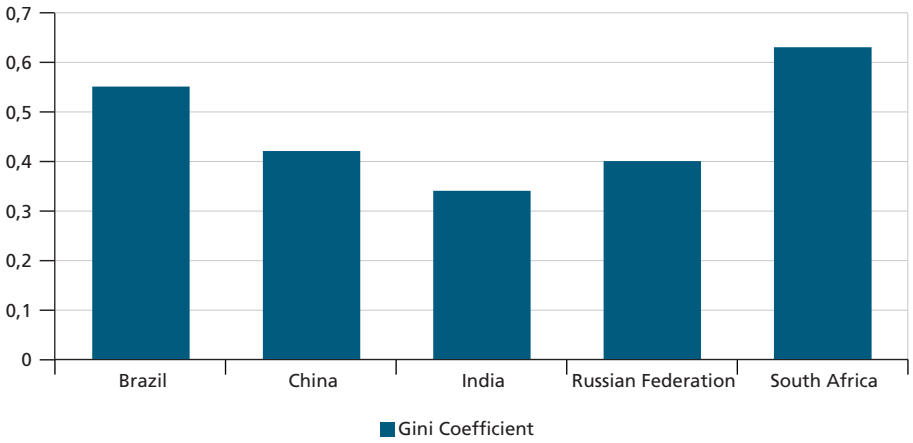
FIGURE 1
Inequality levels (Gini Coefficient of household income), BRICS, early 1990s and late 2000s



Source: OECD (2010). Economic Policy reforms 2010: Going for Growth.

However, against the World Bank's World Development Indicators 2013 (see figure 2), a different picture emerges, with lower levels recorded for Brazil, the Russian Federation, India and South Africa.

FIGURE 2
Gini coefficient, World Bank World development indicators



Source: World Bank (2013). World Development Indicators 2013. Washington, DC, World Bank, <http://data.worldbank.org>.

Data for China, however, reveal a steady inequality level in 2013. Given these variations, the methodological differences between the OECD and World Bank reports need to be investigated further. These variations suggest the need for a common BRICS data collection methodology and collation strategies.

Against the above background and in line with the BRICS agenda to progressively advance better life for all, BRICS countries have increasingly adopted social protection as a key response. Adato and Hoddinott (2008) describe social protection as "policies and programmes that protect people against risk and vulnerability, mitigate the impact of shocks, and support people with chronic incapacities to secure basic livelihoods". Social protection can be grouped under two main categories: *social security* – namely, contributory schemes that protect income earners and their dependents against temporary or permanent involuntary loss of income as a result of exposure to contingencies that impair earning capacity (Kaseke, 2005) – and *social assistance*, which refers to non-contributory assistance or benefits provided to poor and needy groups in a population.

The provision of social security in all the BRICS countries is enshrined in legislation and regulations. In Brazil and South Africa, the Constitutions serve as the legislative foundation, while in India, the Russian Federation and China social protection programmes and policies are linked to the promulgation of various government labour regulations. It is largely due to this enabling legislative and regulatory framework that virtually all BRICS countries provide workers with various forms of social security (see table 4).

TABLE 4
Types of social security programmes – BRICS (2013-2014)

Country	Old age, disability and survivors	Sickness and maternity		Work injury	Unemployment	Family allowances
		Cash benefits for both	Cash benefits plus medical care			
Brazil	Yes	Yes	Yes	Yes	Yes	Yes
Russia	Yes	Yes	Yes	Yes	Yes	Yes
India	Yes	Yes	Yes	Yes	Yes	[1]
China	Yes	Yes	Yes	Yes	Yes	Yes
South Africa	Yes	[2]	[2]	Yes	Yes	Yes

Source: International Social Security Association (2014). Social Security Programs, Throughout the World. Washington, DC, Social security Administration.
Notes: [1] Has no programme/information not available.
[2] Coverage is provided under other programmes or through social assistance.

With respect to social assistance, Brazil is not only increasingly seen as a model for BRICS but for developing countries generally. Numerous evaluations of the Brazilian system have consistently shown that it has resulted in significant

declines in poverty (from 16.4 per cent in 1995 to 4.7 per cent in 2009) and reduced inequality by more than 10 per cent in the same period. The decrease in poverty and inequality in Brazil has not come solely as a result of the introduction of the conditional cash transfer programme *Bolsa Familia*. The reduction has also been a result of employment creation, continuing increases in the minimum wage, and the wide distribution of social security benefits, which are, in turn, indexed to the minimum wage.

Russian Federation has since the 1990s been very successful in reforming its soviet era social protection system to one which today covers a larger proportion of it citizens. Financed through federal and regional budgets the intention of Russian social policy is to improve the health of the population and improve life expectancy, to increase the minimum wage to sustainable levels, address the problem of old age poverty and to structurally and technologically modernize health care, education and other social spheres, making quality services accessible to the public. (Government of the Russian Federation, 2008) Today Russian citizens have access to pension insurance, obligatory health insurance, unemployment insurance, occupational accident and disaster insurance, disability insurance and social payments for maternity and child care, some of which were previously unavailable. (ISSA,2013). There is also tax relief, housing subsidies, free public transportation and other benefits for people with low incomes. According to the Federal State Statistics Service (2010) social insurance programmes now cover the majority of the country's population of 142 million. In particular, over 38 million retirees are covered by pension insurance; over 130 million people by obligatory health insurance; and the total working population, over 72 million people, by other types of social insurance programmes (Federal State Statistics Service, 2010).

India also has a number of large national social assistance programmes implemented at both the central and state levels. There are three distinct types of programmes: *i*) labour market/microcredit programmes designed to provide food for work and generate employment for able-bodied people, especially in rural areas; *ii*) a food-for-work programme; and *iii*) employment assurance schemes. There are also welfare programmes for specific vulnerable groups such as the elderly, people with disabilities, and pregnant or lactating mothers. These include a food distribution system providing subsidised rice to poor people, and a mother and child protection scheme, as well as one that provides housing for poor people (Ministry of Rural Development (India), n.d.).

China has a social assistance system that comprises the following: a minimum livelihood guarantee system which covers urban and rural residents whose per capita income is lower than the local minimum living standards; a five-guarantee

scheme which is a type of welfare scheme for widows, people with disabilities and orphans in rural areas that provides basic livelihood and funeral expenses; and medical assistance systems that cover families in rural areas suffering from serious illness affecting their basic livelihoods, and whose individual medical expenses are unaffordable. In urban areas, the medical assistance system covers family members suffering from serious illnesses that affect their basic livelihoods, and the assistance method combines direct relief aid payments with a waiver of some medical costs (Juwei, 2010).

With just over 16 million recipients as of the end of January 2013, out of an estimated population of over 50 million people (Statistics South Africa, 2014a), South Africa's social assistance system is one of the most comprehensive in the developing world. It is wholly made up of social assistance and comprises grants that provide guaranteed monthly cash payments to targeted individuals, essentially children, the elderly and people with disabilities.

1.2 Education

Following the Fortaleza Summit, the BRICS nations have decided to expand their focus to social development issues. A key step was the formal commitment to strengthen their cooperation in education at a ministerial level. In addition, the Ministers of Education from the BRICS nations have agreed to work with UNESCO to support progress in education through coordinated actions and advocacy. This agreement was reached at the 37th Session of UNESCO's General Conference in Paris on 6 November 2013.

The priority areas identified for BRICS-UNESCO cooperation were data collection, learning assessments, technical education and training, and the use of information and communication technology (ICT) in education (UNESCO Press, 2013). In addition the Ministers agreed to strengthen linkages among BRICS universities. The collaboration with UNESCO is also meant to accelerate progress in attaining the Education for All (EFA) goals, which relate to the following issues (UNESCO, n.d.):

- expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children;
- ensuring that by 2015 all children, particularly girls in difficult circumstances and those belonging to ethnic minorities, have access to, and complete, free and compulsory primary education of good quality;
- ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life-skills programmes;

- achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults;
- eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality; and
- improving all aspects of the quality of education and ensuring excellence so that recognised and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills.

With respect to domestic law and policy, Brazil has a National Education Plan for 2014-2024; Russia launched its national project Education in 2005, which provides a framework for development in education; in India there is the Twelfth Five-Year Plan for 2012-2017; China has a National Plan for Medium- and Long-term Education Reform and Development for 2010-2020; and in South Africa there is the National Development Plan Vision 2030 (2011).

Common policy areas relate to expanding pre-primary and higher education, and are concerned with reducing inequalities and adopting use assessment systems to deal with improving cognitive and social competencies. The BRICS nations are also prioritising early childhood development (ECD) programmes.

For higher education, all BRICS nations commit to developing competitive higher education institutions. In this regard there is clear commitment to two areas: providing access to the majority of youth to graduation, and promoting high-level institutions of learning and research that can enhance the economy through innovation and productivity. Brazil plans to increase the gross enrolment ratio in higher education to 50 per cent of the population aged 18-24 and the net enrolment ratio to 33 per cent by 2020. High targets are planned for 2020 related to the awarding of masters- and doctorate-level degrees (Brazil Ministry of Education, 2014).

The MDGs for education focused on achieving universal primary education. In relation to the net enrolment in primary education, using the data as provided by the UN Inter-Agency and Expert Group (UN IAEG) on the MDGs, the BRICS nations have fared well. Table 5 presents their results using the most recent data collected. The indicator is calculated by identifying the total number of learners enrolled in primary school divided by the total age-appropriate population of school-going children.

TABLE 5
Total net enrolment ratio in primary education

Country	Year	Both sexes	Boys	Girls	Parity index
Brazil	N.D.	92.5	92.6	92.4	1.00
China	2013	99.7	99.7	99.7	-0.02
India	2003	90.8	92.2	89.2	0.97
Russian Federation	2012	97.2	96.6	98.0	1.01
South Africa	2012	90.5*	90.3*	90.7*	1,00

N.D = no data.
Sources: China, India, Russian Federation and South Africa: United Nations Inter-Agency and Expert Group on Millennium. Development Goals (2014). Indicators and Millennium Development Goal Indicators Database.
Brazil: IGBE (N.D.), population aged 6-14 years, in elementary school.

According to the UN IAEG, South Africa achieved an estimated 90.5 per cent net enrolment of both genders. The strongest performing BRICS nation is the Russian Federation, which achieved 97.2 per cent net enrolment and had a slightly higher percentage of females enrolled than males in 2012. The net enrolment rate in primary education in China reached 99.81 per cent in 2014, with 99.7 per cent for boys and 99.8 per cent for girls (China Education Development Statistics Bulletin 2014 from Ministry of Education of PRC).

The literacy rates indicator (see table 6) is calculated by determining the percentage of the population aged between 15 and 24 years who can both read and write with a short statement on everyday life (UN IAEG, 2014). These data are disaggregated by gender, allowing researchers to identify if there are gender inequalities related to literacy. The best performing nations in respect of this indicator are China and Russia, achieving a 99.6 per rate literacy rate in 2010. Data collected in 2006 indicate that India achieved a rating of 88.4 per cent, with 14 per cent fewer literate females than males. Russia, South Africa and Brazil each performed similarly well in achieving 99.7 per cent, 98.9 per cent and 98.6 per cent, respectively.

TABLE 6
Literacy rates of 15-24-year-olds, both sexes, percentage

Country	Year	Both sexes	Boys	Girls	Parity index
Brazil	2012	98.6	98.2	99.0	1.0
China	2010	99.6	99.7	99.6	1.0
India	2006	81.1	88.4	74.4	0.8
Russian Federation	2010	99.7	99.7	99.8	1.0
South Africa	2012	98.9	98.5	99.3	1.0

Sources: United Nations Inter-Agency and Expert Group on Millennium Development Goals (2014). Indicators and Millennium Development Goal Indicators Database.

The BRICS nations believe that the collaboration with UNESCO will assist in achieving the EFA goals and in informing the post-2015 SDG agenda (South African Government News Agency, 2013).

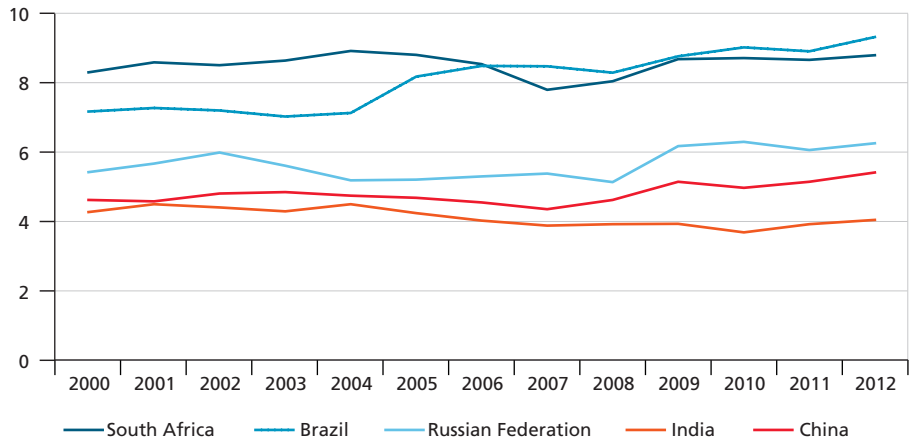
The BRICS nations are promoting student exchanges. China and India regularly send the largest number of students beyond their borders to study. The Russian Federation and Brazil similarly also have a number of students who study abroad. In addition, Brazil attracts students from Latin America and Portuguese-speaking areas of Africa. The Russian Federation has established the People's Friendship University, which spearheads the initiative to create a BRICS Network University to link higher education academic institutions across BRICS.

1.3 Health

The BRICS Ministers of Health have committed to work "nationally, regionally, and globally to ensure that universal health coverage is achieved" (BRICS, 2013a; McKee et al., 2014). The goal of universal health coverage among BRICS countries is to ensure that citizens have health coverage in a publicly financed health system. This system will provide financial protection and equitable access to adequate health care services.

Health expenditure varies substantially among the BRICS countries, depending on the measure used. Using health expenditure expressed as a percentage of GDP, BRICS countries rank (from highest to lowest) as follows: Brazil, South Africa, Russia, China and India (see figure 3). However, when health expenditure per capita was measured in the same year, the rankings differed slightly: Brazil, Russia, South Africa, China and India. Brazil increased its health expenditure significantly between 2004 and 2012, with an increase greater than 2 percentage points from 7.1 per cent to 9.3 per cent.

FIGURE 3
Total expenditure on health as percentage of GDP (2000-2012)



Source: WHO National Health Accounts Database.

The trend shows that all the BRICS countries have increased their per capita expenditure on health. However, the magnitude of the changes tends to vary by country. Total health care expenditure comprises two categories: general government and private health expenditure. Inadequate government allocation of financial resources to health care creates a financial burden for users of the health care system. The proportion that the Indian government contributes to health care is lowest, while that of the Russian Federation is the highest (see table 7).

TABLE 7
BRICS general government health expenditure and out-of-pocket expenditure (2011)
(In %)

	General government health expenditure as a proportion of total health expenditure	Out-of-pocket expenditure as a proportion of total health expenditure
Brazil	45.7	31.3
Russia	59.7	35.4
India	31.0	59.4
China	55.9	34.8
South Africa	47.7	13.8

Sources: World Bank (2013). World Development Indicators.

In all BRICS countries, except South Africa, residents pay significantly out of pocket for their health care, which implies they have less financial protection than South African citizens. South African residents spend proportionately less out of pocket for health care, mainly because the private sector has a large expenditure for health care relative to a small minority population it serves, most of whom have medical insurance.

The economic gains experienced by BRICS countries need to be used to boost health infrastructure, improve access to quality health care and ensure that medicines are affordable. Almost all BRICS countries have made policy statements in support of strengthening health systems, but few have matched these statements with an increase in the government's allocation to health care. Brazil has introduced the state-run *Sistema Único de Saúde* (SUS – Unified Health System), which now covers 90 per cent of the population (Gragnolati et al., 2012). While coverage is good, the system is inadequately funded (cited in Gomez, 2013).

In India, a policy to provide universal health coverage has been discussed for some time but not yet been implemented (Bajpai, 2014). Evidence shows that the Indian government continues to spend far less on health than its BRICS counterparts. The Chinese Constitution gives Chinese citizens the right to health care, and 95 per cent of the population have some form of health insurance. Care needs to be taken to ensure that funds are allocated such that inequity in access

to quality health care is reduced between urban and rural areas. Structural reforms in China include: basic medical insurance for urban residents, which is financed by individual payments and government subsidies and has a total reimbursement rate of up to 85 per cent; and a new type of rural cooperative medical care system with a total reimbursement rate of up to 70 per cent of the total expense or up to CNY30,000.

In South Africa, the Constitution mandates the State to progressively realise the right to health. Consequently the government has announced its intention to introduce national health insurance over a period of 14 years (Department of Health, 2011). To date, the government has yet to allocate funding for the programme, save for the implementation of small pilot projects that were rolled out in 2011.

Despite the observation that BRICS countries have progressive policies supported by legislation on access to essential medicines, out-of-pocket expenditure for medicines has increased, compounded by shortages in the supply of generic medicines. For example, Brazil's Constitution guarantees citizens the right to access essential medicine, yet it was reported that 40 per cent of the generics were not available (Bertoldi et al., 2013). When generics were available, they were more likely to be found in the private than in the public health sector which serves the majority of the population. Furthermore, about 25.5 per cent of poor people were reported to be paying for medication out of pocket (ibid.).

As with Brazil, the Russian Federation has a constitutional mandate to provide free medicines to its citizens (Papovich et al., 2011) but is plagued by shortages of medicines in poor areas. For example, it was reported that 20 per cent of the population are not able to access medicines, and only 11 per cent of the population has free access to state-assisted discounts for medicine (Gomez, 2013). Similar to Brazil and the Russian Federation, China's Constitution also guarantees its people equal access to medicines regardless of socio-economic status.

In contrast, South Africa's Constitution does not provide guaranteed access to essential medicines. Instead, the South African government passed legislation aimed at reducing the cost of medicines, such as parallel importation, compulsory licensing in line with the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS), single exit price, Essential Drug List and standard treatment guidelines. South Africa still has to reform its policies to implement these TRIPS agreements.

Despite challenges related to the allocation of financial resources and implementation of progressive policies, it is encouraging that in most BRICS countries health outcomes measured by MDG indicators are showing positive trends. In all BRICS countries, except South Africa (where there was an increase), maternal mortality rates per 100,000 live births declined by more than 50 per cent during the decade up to 2010. According to the data

reported from 1990 to 2013, there has been a very sharp decrease in India, where the maternal mortality rate dropped from 560 to 190 per 100,000 live births (WHO, 2010). With respect to infant mortality rates per 1000 live births (table 8), South Africa has experienced a decline since 2005. The other member states each experienced declines of greater than 50 per cent between 1990 and 2012 (WHO, 2010).

TABLE 8
Infant mortality rate (probability of dying between birth and age 1, per 1000 live births)

	1990	1995	2000	2005	2010	2013
Brazil	51	40	29	20	15	12
China	50[1]	36	32	19	13	10
India	88	78	67	56	46	41
Russian Federation	22	22	20	14	10	9
South Africa	47	46	52	51	35	33

Source: World Health Organization (2013). World Health Statistics, 2013; system for Chinese Maternal and Child Health Surveillance.
Note: [1] 1991.

Another crucial health outcome indicator is life expectancy at birth. In all the BRICS countries, females live longer than males. However, the extent of this gender disparity in life expectancy varies by country. In 2012, Russian females lived 12 years longer than their male counterparts, Brazilians 7 years longer, and Indians, Chinese and South Africans 3 years longer. Brazil, China and India each displayed increasing life expectancies across genders when comparing data from 1990, 2000 and 2012. The trend is not as clear in the Russian Federation and South Africa. Russia experienced a decline in life expectancies between 1990 and 2000, while South Africa experienced a decline between 1990 and 2000 and then stagnation between 2000 and 2012.

South Africa has the lowest life expectancy, due to the high rates of HIV and AIDS. South Africa is attempting to increase its life expectancy by preventing new HIV infections and providing treatment to those eligible to receive antiretroviral therapy (ART). The latest mortality report shows that there was a decline from 613,128 deaths in 2006 to 505,803 deaths in 2011, resulting in a life expectancy of 59.1 years for males and 63 years for females (Statistics South Africa, 2014b).

1.4 Migration, urbanisation and infrastructure

The BRICS countries are facing an increase in migration and urbanisation – a common trend in many emerging economies of the world. As their economies develop and industrialisation increases, people migrate to urban areas, seeking

employment and better living conditions. Similarly, as the threats of climate change increase, people have begun to move from often vulnerable and under-resourced rural areas to the urban centres. In fact, according to the Population Division of the UN Department of Economic and Social Affairs, in the next four decades urban residents will account for 66 per cent of the population in developing countries (Heilig, 2012).

Migration is a critical issue for all BRICS members, indicating the existence of a number of common problems and policy goals, even though their migration challenges vary significantly. At present, migration has acquired a truly worldwide importance: in 2013, 232 million people worldwide, or about 3 per cent of the world population, were international migrants (UN Population, 2013). Peace and security issues related to illegal cross-border migration are dealt with under Pillar 2.

In terms of internal migration trends, migration to urban areas has increased significantly in the BRICS countries. Brazil has the largest urban population (representing 84.6 per cent of its total population), while India has the smallest (31.3 per cent). With the exception of India, all member states have a larger urban than rural population. Even so, the rates of urbanisation in India and China are the highest at 2.4 and 2.7, respectively. In Brazil, the Russian Federation and South Africa urbanisation rates range from 0.2 to 1.8.

Since urbanisation has been occurring within a relatively compressed timeframe, many cities have not managed to provide the required infrastructure for housing, water and sanitation services. In many cases this backlog has led to the growth of urban inequality, with large segments of the population inhabiting poorly located and poorly serviced informal settlements (Heilig, 2012).

An added challenge has been that of unequal access to basic infrastructure and services in urban and rural areas. Despite the critical importance of sanitation to poverty alleviation, health care, human development and dignity, it has traditionally been viewed as a lesser developmental priority. This is not only because in many places sanitation is a taboo subject but also because there are difficulties with defining what sanitation is and who bears the responsibility for providing it (the State, individuals or communities).

Having committed to the MDGs, BRICS countries have generally made significant progress in achieving outcomes relating to water and sanitation. As illustrated in table 9, India has made the slowest progress in improving sanitation targets, with access increasing from 25 per cent of the population in 2000 to 34 per cent in 2010 (World Bank, 2014).

TABLE 9
MDG 7: Ensure environmental stability (2000, 2005 and 2010)
(In % of population with access)

Year	Improved sanitation facilities			Improved water source		
	2000	2005	2010	2000	2005	2010
Brazil	74	76	79	94	96	98
Russia	72	71	70	95	96	97
India	25	30	34	81	86	92
China	44	55	64	80	87	91
South Africa	75	77	79	86	89	91

Source: World Bank (2014). Millennium Development Goals.

The large urban-rural disparity, especially in sub-Saharan Africa and South Asia, is the principal reason why the sanitation target of the MDGs will not be achieved. Even within the BRICS countries, the lack of improved water and sanitation facilities is predominantly a rural and poverty-related phenomenon. Rich households in urban areas are more likely to have piped water on the premises, or toilets connected to a sewer system, whereas poor households often use communal sources or need to buy their water from vendors, share public facilities or rely on pit latrines (ibid.).

With regards to improved access to water, all of the BRICS countries have achieved very high results, with Brazil and the Russian Federation having the highest rates at 98 per cent and 97 per cent, respectively. In fact, Brazil has achieved the MDG: the target of halving the proportion of people without access to an improved drinking water source was achieved in 2010, five years ahead of schedule (ibid.).

In addition, high rates of population growth and urbanisation have meant that the provision of affordable housing is a universal problem. The most notable shortages of adequate housing are in developing nations, where housing provision has failed to keep pace with economic development. Rising income inequalities, and a tendency for housing costs to rise faster than incomes, have made it difficult for younger and poorer households to find adequate shelter. It should be noted that in most of the BRICS countries unequal access to basic services such as housing, water and sanitation has been a result of past administration and policies. In South Africa apartheid policies enforced racially segregated urban policies, which determined different levels of access to housing, sanitation and water.

The Brazilian housing sector has marked a number of achievements since the turn of the millennium. In particular, the urban and housing sectors gained leverage with the creation, in 2003, of the Ministry of Cities (UN-Habitat, 2013). In 2000 a Brazilian constitutional amendment recognised the right to housing.

The law in Brazil seeks to define how to regulate urban property and urban policy so as to guarantee the right to housing for all of its population. In 2005 Federal Law no. 11.124 created the National System of Social Housing (*Sistema Nacional de Habitação de Interesse Social*). In 2009 Brazil started implementing the national social housing programme 'My House, My Life' (*Programa Minha Casa, Minha Vida* – PMCMV). This programme has also become a flagship programme to boost the labour market, reduce poverty and tackle socio-economic inequality.

The Russian housing system has gone through significant changes since market liberalisation in the 1990s. In 2005 the Housing Code was introduced, which aims to reduce the State's commitment to the provision of social housing from 10 per cent to 5 per cent (Khmelnitskaya, 2012). There continues to be a large backlog for housing. To address this, the new Housing Code aims to introduce the following reforms: first, citizens who registered for social rental contracts before 1 March 2005 retain their right to social housing (Article 6, paragraph 2 HC). Second, following that date the queue for social housing would be accessible only to poor people, which would be determined on the basis of their income and the property they own. In addition to these people, the following are also eligible for social housing: orphans and children left without parents; victims of disaster and emergency situations; those living in dilapidated houses subject to resettlement; and those living in apartments occupied by several families.

Housing demand in India has been driven in large part by high rates of urbanisation and internal labour migration (Government of India Ministry of Housing & Urban Poverty Alleviation, 2007). The growth of the Indian workforce has also had an impact on the rates of urbanisation in India. The cities present far better opportunities for employment and an improved living standard. According to the 2001 Indian Census, 61.8 million people (23.1 per cent of the urban population) reside in slums; it is estimated that 55 per cent of the population of Mumbai lives in slums. The quality of housing in slums is extremely poor. An important reason for this is insecurity of tenure. Slums are also severely deficient in basic services such as potable water, sanitation, sewerage, storm water drainage and solid waste disposal.

Chinese housing policy has undergone significant reforms in the last two decades. In particular, reform has taken place in the area of improving housing affordability, allowing for greater ownership and increasing access within urban areas. The current Chinese housing framework includes the Economical and Comfortable Housing (ECH) programme, which aims to serve lower-middle and middle-income urban families who may not be able to purchase market-rate housing. Low-cost housing units are built by real estate developers for sale, not for rent, to eligible families through market transactions.

Over the past 20 years, 3.7 million houses and services sites were delivered in South Africa, providing approximately 12.5 million people with access to shelter and accommodation and a fixed asset. About 56 per cent of all subsidies were allocated to female-headed households. The Constitution of the Republic of South Africa guarantees everyone's right of access to adequate housing. The State must take reasonable legislative and other measures, within its available resources, to progressively realise this right. Beyond the Constitution, since 1994 a raft of laws has been promulgated relating to housing, which attests to the broad and complex nature of the housing sector in the country. The 1994 *White Paper on Housing* provided the framework for the country's ambitious housing development target of building 1 million state-funded houses in the first five years of office. It sets out the underlying policy principles, as well as guidelines, norms and standards that apply to all government housing programmes.

1.5 Climate change, ecological degradation and food insecurity

Restructuring of world economy towards new pattern constitutes one of the main challenges to the future of development of BRICS countries. Considering the fact that it is not an obstacle but rather a driver to growth, being generator of jobs, a way to reducing poverty and improving quality of life, it is vital to create relevant conditions for this pattern of development through environment-friendly industries and investments. As emerging economies with large populations, land masses and disparities among their people, BRICS countries stand to be significantly impacted by climate change. The particular vulnerability of member states has thus required them to actively participate in the negotiations and planning underway within their regions and internationally. In the BRICS Fortaleza Declaration of 2014 all member states committed to collectively address the challenges posed by climate change and environmental degradation. In so doing they stated the following:

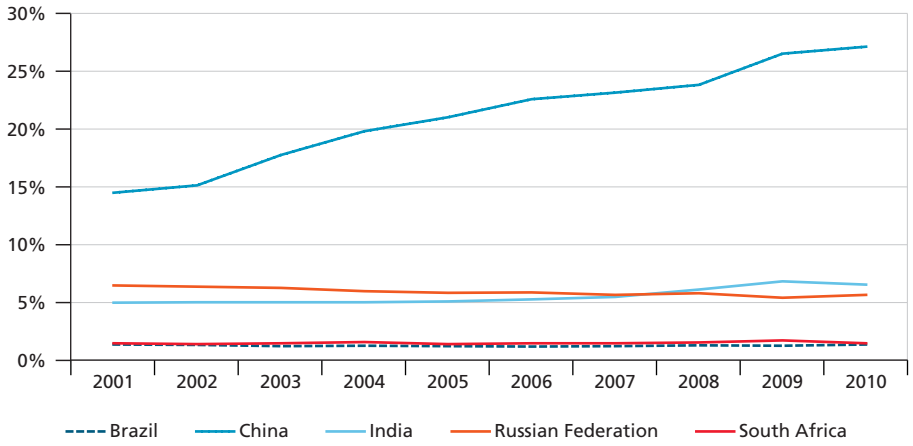
"Acknowledging that climate change is one of the greatest challenges facing humankind, we call on all countries to build upon the decisions adopted in the UN Framework Convention on Climate Change (UNFCCC) with a view to reaching a successful conclusion by 2015, of negotiations on the development of a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties, in accordance with the principles and provisions of UNFCCC, in particular the principle of common but differentiated responsibilities and respective capabilities. In this regard, we reiterate our support to the Presidency of the 20th session of the Conference of the Parties and the 10th session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol, to be held in Lima, Peru, in December 2014. We also note the convening of the UN Climate Summit 2014 to be held this September" (BRICS, 2014).

By virtue of the size and rate of growth of the economies of the BRICS countries, their energy demands, their energy imports (for instance, in the case of China and India) and their atmospheric emissions of various types, they make essential partners in any regional or global discussions relating to climate change or the production and consumption of energy.

The 2013 edition of the International Energy Agency's report *CO_2 Emissions from Fuel Combustion, Statistics Highlights* (see figure 4) portrays BRICS nations' contribution to CO_2 emissions in the world. Although China is responsible for more than 25 per cent of the world's emissions, Russia and South Africa had much higher per capita emissions in 2011, with values of 12.2 per cent and 9 per cent, respectively. While China's per capita share of emissions was 6.2 per cent, India had the lowest per capita share of CO_2 emissions with a value of 1.7 per cent.

FIGURE 4

CO_2 emissions of BRICS countries as a percentage of the world's CO_2 emissions (2001-2010)
(In %)



Source: International Energy Agency (2013). CO_2 Emissions from Fuel Combustion 2013, Statistics Highlights.

While bearing in mind that fossil fuel remains one of the major sources of energy, BRICS reiterates the belief that renewable and clean energy, research and development of new technologies and energy efficiency can be important drivers to promote sustainable development, create new economic growth, reduce energy costs and increase efficiency in the use of natural resources. Considering the dynamic link between renewable and clean energy and sustainable development, it is important to reaffirm the importance of continuing international efforts aimed at promoting the deployment of renewable and clean energy and energy efficiency technologies, taking into account national policies, priorities and resources.

In India, China and South Africa there is a strong reliance on coal for generating electricity. In 2011 about 93.7 per cent of South Africa's electricity production was from coal, compared to 78.9 per cent in China and 67.9 per cent in India. India, meanwhile, has plans to expand its clean energy production, adding 20 gigawatts (GW) of solar energy capacity by 2022 and continuing to grow the wind sector, already the fifth largest in the world. Russia's electricity provision differs from the other countries, with 49 per cent of its electricity generated from natural gas, and an additional 16 per cent derived from nuclear sources.

Biodiversity is critical to ensuring environment sustainability. It is interconnected with climate change and strongly affected by it (Convention on Biological Diversity, 2015a). Continued biodiversity loss has a significant impact on the BRICS nations, as they contain 8 of the world's 34 biodiversity hotspots (Wu, 2011). In addition to the loss of species, entire ecosystems are also in danger of collapsing.

Understanding the magnitude of the problem, BRICS is committed to the implementation of the Convention on Biological Diversity and its Protocols, with special attention to the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets (Convention on Biological Diversity, 2015b). The Aichi Targets focus on:

- addressing the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society;
- reducing the direct pressures on biodiversity and promoting its sustainable use;
- improving the status of biodiversity by safeguarding ecosystems, species and genetic diversity;
- enhancing the benefits from biodiversity and ecosystem services to all; and
- enhancing implementation through participatory planning, knowledge management and capacity-building.

For each of these goals, individual targets have been set to assist in monitoring how effectively the goals are being reached. In attempting to achieve these goals, China has begun investing in reforestation, which has resulted in a 2.9 per cent annual gain in forest coverage since 2000. Brazil has introduced additional legislation in an attempt to curb deforestation, while Russia has hosted a Tiger Summit that was attended by 13 countries which pledged to double the population of wild tigers by 2020 (Wu, 2011).

The BRICS Ministers of Agriculture and Agrarian Development met in Pretoria in 2013, following the Ethekwini Summit, to discuss the negative effects of climate change on food security (DIRCO, 2013). The discussion focused on the need to promote government interventions and participatory approaches for a social-ecological economic development trajectory. Such interventions should strengthen local economies and increase their resilience to exogenous shocks,

especially at the household level, where food, water and energy dependence is high. It should also emphasise small-scale and sustainable livelihoods. This would mean support in the form of policies and subsidies for improving local food production in rural and urban areas through agro-ecological production, seed-saving and local food markets, among other interventions.

Before the 2013 Ministers' meetings, the first meeting of the BRICS Agricultural Cooperation Working Group was held in Beijing, China, in August 2011. At this meeting, the Working Group agreed to establish an Action Plan on Agricultural Cooperation of the BRICS countries for 2012-2016. The focus of the Action Plan would be to ensure access to food for the most vulnerable.

Four of the five BRICS nations experience difficulties with respect to feeding their people. Brazil has greatly reduced the proportion of undernourished citizens from approximately 15 per cent to 6.9 per cent. About 10 per cent of the Indian and Chinese populations are undernourished or food deprived; Brazil and South Africa are a little better, since less than 10 per cent of their populations are undernourished. Food security is a major concern for India and China. Due to their very large populations (2.5 billion people in total), they must both dramatically increase agricultural productivity and maintain reliable food suppliers abroad. Food shortages can lead to social unrest. Learning from Brazilian knowledge about agricultural productivity is, therefore, vital (Steunkel, 2013).

2 MAIN CHALLENGES

2.1 Social protection safety net programmes for all

Large proportions of BRICS populations are deprived of social protection due to the continued existence and expansion of the informal sector. According to the 2014 International Labour Organization report *Global Employment Trends*, demographic challenges are likely to have the most influence on benefit provision in the BRICS countries, since increasing life expectancy and a descending birth rate mean countries will age rapidly (International Labour Organization, 2014).

Ensuring access to social protection services is a challenge for all the BRICS members due to the physical size of the countries and their populations. Ensuring universal access to social protection has required vast logistical operations for those living in remote rural areas. Other challenges include banking facilities used as a condition for accessing benefits. In India only 40 per cent of the population has a bank account, while only 5 per cent of villages have access to a commercial bank (Bank of India, n.d.). In the case of South Africa the distance and cost to travel to major cities or towns to access services is a major constraint.

This is not to say that there are no successful experiences of cooperation and sharing. The creation of the framework for BRICS cooperation on population matters was successfully concluded at the 2014 BRICS Inaugural Seminar of Officials held in South Africa (Partners in Population and Development and Experts on Population Matters, 2014). The main objective of the inaugural seminar was to exchange knowledge and experiences on each country's population trends, dynamics and policy responses. The framework, based on the ICPD Programme of Action, agreed to collaboration through dialogue, cooperation, sharing of experiences and capacity-building on population-related issues of mutual concern to member states (Dlamini, 2014).

The document covers a wide range of issues including, "gender and women's rights; sexual and reproductive health and reproductive rights; demographic transition and post-transition challenges, including population structure change, population ageing and mortality reduction/increasing life expectancy and social integration of migrant farmers during rapid urbanization; information on population and health, including data collection and utilization, and sharing information and experience on improving the equity and quality of health of women and children" (Department of Social Development, South Africa, n.d.).

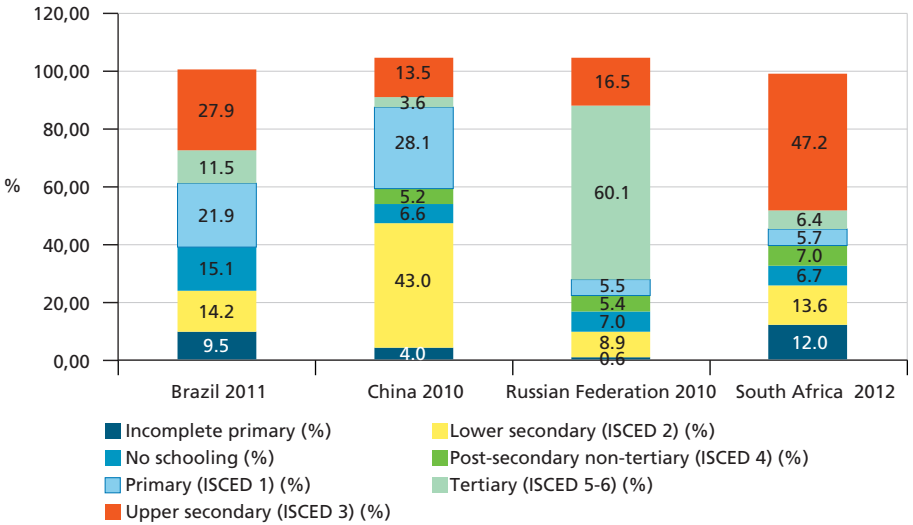
The Fortaleza Declaration (July 2014, Brazil) reinforced BRICS commitment to collaborating on issues of social protection and labour. This commitment was further endorsed by the BRICS Trade Union Forum (2014), where member unions agreed to: "1. Work on the basis of the standards and principles of the International Labour Organization (ILO) to promote Decent Work, boost employment, secure a universal social protection floor and promote the transition from the informal to the formal economy; 2. Defend the legitimate rights of the working class within a progressive social dimension; 3. Promote a development agenda that puts industrialization, environmental justice and human progress for equitable and fair growth models at the center of our common commitments; 4. Establish a dialogue and cooperation to promote peace, security, human rights and global sustainable development; 5. Strengthen the social protection for young people and women."

2.2 Education

With regard to higher education, in India the challenge is particularly difficult due to the need to widen access to institutions of higher education while ensuring that such institutions are affordable (Indian Ministry of Human Resource Development, 2013). Russia is experiencing a decline in demand for tertiary education. To address this decline in student enrolment, the country decided to merge or close some tertiary institutions (Nikolaev and Chugunov, 2012; Russian Federation, 2014). In South Africa the challenges experienced relate to high drop-out rates and low graduation rates of previously disadvantaged population groups. This is attributed to an inadequate level of preparedness of children leaving secondary school (HESA, 2009). In Brazil the primary challenge is to increase university enrolment.

The UNESCO Institute for Statistics database identifies the highest level of education achieved by persons aged 25 years and older. The results of this survey place the differences related to the socio-economic position of some of the BRICS nations with available data in perspective (figure 5).

FIGURE 5
Population (aged 25+) by highest level of education
(In %)



Source: UNESCO Institute for Statistics.

Student repetition and high drop-out rates are worrying trends that hinder efforts to achieve universal primary education. MDG 2.2 identifies the proportion of pupils who start grade 1 and actually reach the last grade of primary school. This indicator is calculated using enrolment and repetition data for two consecutive years. Based on this method, India is found to perform poorly, as data collected in 2001 highlight a 61.4 per cent retention rate.

TABLE 10
Percentage of pupils starting grade 1 who reach last grade of primary education

Country	Latest year of data	Both sexes	Boys	Girls	Parity index
Brazil	2005	88.7	-	-	-
China	2014	92.6	-	-	-
India	2001	61.4	59.7	63.5	1.1
Russian Federation	2011	96.6	89.8	92.6	1.0
South Africa	2003	77.0	75.0	79.1	1.1

Sources: United Nations Inter-Agency and Expert Group on Millennium Development Goals (2014). Indicators and Millennium Development Goal Indicators Database.

The difference in interpretation of the definition of primary education may explain the low values of primary schooling suggested by the UNESCO data. In Brazil in 2011 approximately 45 per cent of the population above the age of 25 had either completed primary education, had started but not completed primary school or had not gone to school at all. Around 39 per cent of the population had either completed upper secondary schooling (27.9 per cent) or some form of tertiary education (11.4 per cent). In the Russian Federation in 2010, approximately 82 per cent of the population had completed either upper secondary schooling (16.5 per cent), a post-secondary but non-tertiary education (5.4 per cent) or some form of tertiary education (60.1 per cent).

In China in 2010, approximately 38 per cent of the population had either completed primary schooling, had started but not completed primary school or had not gone to school at all. About 22 per cent of the population had either completed upper secondary schooling (13.5 per cent), a post-secondary but non-tertiary education (5.2 per cent) or some form of tertiary education (3.6 per cent). (UN Inter-Agency and Expert Group on Millennium Development Goals, 2014)

In 2012 in South Africa approximately 24 per cent of the population had either completed primary schooling, had started but not completed primary school, or had not gone to school at all. Around 47 per cent of the population had completed upper secondary school, but only an additional 13 per cent had completed tertiary education or a post-secondary/non-tertiary level of schooling. This indicator may provide a clue for understanding the difficulties experienced in accessing higher education in the BRICS countries.

Furthermore, BRICS members are encountering a large-scale, long-term brain drain – through educational emigration and the direct outflow of qualified professionals – leading to a significant loss of both highly qualified professionals and financial losses derived from the expenses incurred on their education in their home countries. Simultaneously, India and China have developed policies and actively worked on both upholding ties with their elite diasporas abroad and bringing some of them back home.

2.3 Health

Non-communicable diseases (NCDs) account for 63 per cent of all global deaths and 80 per cent of deaths in low- and middle-income countries (WHO, 2010). BRICS Health Ministers have tasked a group to focus on NCDs. Table 11 presents premature mortality (death before age 70) due to NCDs and associated age-adjusted mortality rates in BRICS countries in 2008. Russians are comparatively more predisposed to die before the age of 70 due to NCDs than other BRICS residents, whilst Brazilians are less likely to die from NCDs.

TABLE 11
Non-communicable diseases deaths before age 70 (%) and age-adjusted death rates, BRICS, 2008

Country	Males (%)	Females (%)	Age-adjusted death rates	Data year
Brazil	52.3	42.2	614.0	2008
Russia	55.0	25.4	1108.6	2007
India	61.8	55.0	781.7	2003
China	43.9	32.0	665.2	2006
South Africa	69.0	53.7	733.7	2007

Source: World Health Organization (2011). Global status report on noncommunicable diseases 2010. Geneva, WHO.

There are major gender disparities in premature mortality, as males are more likely than females to die from NCDs. The gender disparities are wide (a 30 percentage point difference) in the Russian Federation, followed by South Africa with a 15 percentage point difference, China (12 percentage points), Brazil (10) and India with the least disparity at 7 percentage points (BRICS, 2013a).

BRICS countries have committed to introduce policies and programmes that aim to reduce the risk factors such as tobacco use, unhealthy diets, physical inactivity, obesity and harmful alcohol consumption that are associated with cardiovascular diseases, diabetes and cancer. In this regard all five BRICS countries have signed, ratified or endorsed the 2012 WHO Framework Convention on Tobacco Control (FCTC), thus committing to cooperation to introduce policies to counter the impact of tobacco advertising and labelling and sales of tobacco products (WHO, 2008). However, with respect to implementation of the FCTC, BRICS countries have not all met the deadlines with respect to compliance with packaging requirements (Article 11) or a ban on advertising domestically and in cross-border areas (Article 13) (WHO, 2012).

Levels of physical activity for maintaining a healthy lifestyle show marked differences among BRICS countries. Based on the WHO estimates, Brazil and South Africa appear to have higher rates of physical inactivity among males and females aged 15 years or older compared to the other three BRICS countries.

Unhealthy diets, involving higher consumption of fats and salt and lower consumption of fruits and vegetables, are related to several outcomes: hypertension, a risk factor for heart diseases, is associated with high consumption of salt; obesity, a risk factor for diabetes, is associated with high consumption of saturated fats and trans-fats; and inadequate consumption of vegetables and fruits is associated with cardiovascular diseases, stomach and colorectal cancer (WHO, 2011). Currently, data are not collected uniformly across BRICS countries on this indicator of unhealthy diets.

Food fortification is the addition of vitamins and minerals to foods while they are being processed (WHO, 2006). A well-designed fortification programme includes foods that are commonly consumed and does not rely on the population eating more of any specific food. In August 2014, 80 countries mandated the fortification of wheat flour, 12 mandated the fortification of maize flour, and 5 mandated the fortification of rice (FFI, 2014a). All BRICS countries have policies supporting food fortification. Both Brazil (Agência Nacional de Vigilância Sanitária, 2002) and South Africa (R504, 2013) have legislation that mandates fortification of wheat flour and maize flour. The former Soviet Union used to fortify wheat flour (Tazhibayev, 2008). The Russian Federation (Jackson, 2002), India (Rah, 2013), China (Zhao, 2004) and South Africa fortified salt for human consumption with iodine in 1995 (Jooste, Weight & Lombard, 2001). Lessons can be learned from the Brazilian and South African experiences with fortification that can be extended to Russia, India and China.

Harmful alcohol consumption is associated with NCDs – specifically, cancers, cardiovascular diseases and liver cirrhosis. In view of the absence of good and comparable data, WHO projected estimates of adult per capita consumption of pure alcohol and identified that China and India have a much lower estimated rate of consumption of pure alcohol (2.6 per cent and 5.5 per cent, respectively) than South Africa, Brazil and the Russian Federation (10.6 per cent, 10.8 per cent and 16.2 per cent, respectively) (WHO, 2010).

HIV/AIDS is a major public health and social problem in BRICS countries, requiring them to share experiences and coordinate approaches, especially since there is increasing movement of people between them. Although BRICS countries differ significantly in the magnitude of the problem, each one of them has a sizeable population living with HIV (see table 12). Among the BRICS countries, South Africa has the largest number of people living with HIV.

TABLE 12
Magnitude of HIV/AIDS pandemic in BRICS countries for adults 15-49 years (2012)

Country	HIV prevalence (%)	People living with HIV
Brazil	0.5	490,000
Russia	1.1	1,300,000
India	0.3	2,088,642
China[1]	0.1	780,000
South Africa	12.2	6,400,000
Total	**2.8**	**11,058,000**

Source: WHO (2013).
Note: [1]2011.

Given the number of people living with HIV in the BRICS countries, it is essential that affordable treatment be made available. Overall, BRICS countries had an estimated 11 million people living with HIV and an average prevalence of 2.8 per cent in 2012-13, skewed by the very high prevalence of HIV in South Africa. In Brazil between 81 per cent and 93 per cent of those eligible to receive treatment (based on the 2010 WHO guidelines) were on ART, a figure similar to South Africa (81 per cent) but much higher than in India, where only 51 per cent were receiving treatment. In China by the end of 2013 the population who received HIV/AIDS treatment was 227 thousand. The rate of adult and child who met the conditions of treatment reached 86.9%. The Russian Federation did not report any numbers on ART (UNAIDS, 2013). As WHO lowers the eligibility criteria for ART, BRICS countries will fall far short of the targets. Globally, the goal is to reach 15 million HIV-positive people with access to lifesaving ART (ibid.).

All five BRICS countries are considered high-burden countries for tuberculosis (TB) (Stop TB, 2014). According to the WHO, although TB is preventable and curable, it is a major killer, with 1.3 million people having died from TB in 2012. TB co-infection with HIV is a leading cause of death in HIV-positive people. However, there are encouraging signs that the TB death rate has declined by about 45 per cent since 1990 (WHO, 2014). Nevertheless, multidrug-resistant TB continues to be a problem in Asia and Africa. These regions will not meet the 2015 MDG target of halting and reversing the incidence of TB and halving the number of deaths from TB from the 1990 baseline (WHO, 2013).

A forum for cooperation by Ministers of Health was established in 2011. BRICS leaders also committed in the Sanya Declaration to work together on common health challenges (BRICS, 2011). BRICS is also committed to work at a national, regional and global level to ensure that universal health coverage is achieved (BRICS, 2013a).

In 2014 the BRICS Ministers of Health committed to cooperate and assist global health agencies to meet the health needs of the world's population. They support "Collaboration with and support of international organizations, including WHO and UNAIDS, the Global Fund to Fight AIDS, Tuberculosis and Malaria and the GAVI alliance, to increase access to affordable, quality, efficacious and safe medicines, vaccines and other medical products that serve public health needs" (Beijing, 2014).

2.4 Migration, urbanisation and infrastructure

There is a need to focus on extracting measurable benefits from the urbanisation process. Urbanisation can often form an important part of overall national development strategies and impart benefits, particularly in expediting industrialisation and increasing productivity and competitiveness.

Encouraging and sustaining effective urban/spatial planning and municipal governance are essential and have proved to be a challenge across the BRICS countries. Insufficient funding for infrastructure programmes such as housing and the provision of services such as sanitation and water may challenge sustainability. Prioritisation is, therefore, essential. Housing backlogs, which exist in all the BRICS countries, mean that there is still considerable work to be done (BRICS, 2013b).

The inequality that exists between urban infrastructure and rural infrastructure is also a central challenge that exists in all member states. It is imperative to recognise the inter-dependencies between urban and rural areas. For example, urban areas in South Africa rely on rural areas for food and primary industries that make significant contributions to the urban and national economies (ibid.). Consequently, development in one should not happen at the expense of the other.

Current cooperation among the BRICS countries in the area of urbanisation and infrastructure development has been in the form of the annual BRICS Urbanisation Forum and the Friendship Cities and Local Government Cooperation Forum. These two events provide a platform for member countries to discuss the challenges faced by cities due to rapid urbanisation. The conferences aim to coordinate efforts to learn from best practices and access available technologies to better manage and plan for the rapid rate of urbanisation. In the Ethekwini Declaration member states reaffirmed their commitment to the outcomes contained in The Future We Want adopted by the 2012 United Nations Conference on Sustainable Development in Rio de Janeiro. (BRICS, 2013c).

On the basis of the 2nd BRICS Urbanisation Forum, member states have committed to:

- share experiences, policy intentions and lessons from practice, and extend dialogue between national, provincial/regional governments and major cities;
- further the goals of building productive and sustainable urban economies;
- share experiences on approaches to local economic development, prioritising the provision of expanded social and economic urban infrastructure, developing integrated transportation networks, including transit-oriented development, mobility planning, and creating a high quality of life for urban citizens and an urban environment that attracts and retains skilled individuals as a draw for businesses looking to invest;
- exchange approaches to integrated spatial planning that address public safety and security, accessible housing, efficient public transportation and improved access to public services and socio-economic facilities;

- explore ways of planning, financing and delivering urban infrastructure in an integrated, socially inclusive and environmentally sustainable manner;
- build collaborative links between each level of government and the people of the BRICS countries, academia and business to assist in understanding urbanisation dynamics and shaping new urban forms, through engagement and liaison with the various BRICS structures, such as the BRICS Business Council and the BRICS Think-Tanks Council; and
- develop mechanisms for peer-to-peer partnerships, comparative studies, evidence-based policymaking and networking among BRICS member states and their research institutions to promote more successful urban development policy and practice.

2.5 Climate change, ecological degradation and food insecurity

The BRICS member states are heavily reliant on fossil fuels. Over 50 per cent of the total fuel sources in BRICS are based on fossil fuel energy (World Bank, 2015).

The move to adopt cleaner energy sources must be encouraged. Clean energy fuel sources are based on fuels that use non-carbohydrate energy that does not produce or emit carbon dioxide. This includes hydropower and nuclear, geothermal and solar power, among others. As at 2008, Brazil had done the most to adopt cleaner energy, as approximately 15 per cent of its energy was derived from these sources. The worst performer of the group is South Africa, deriving only 2.7 per cent of its fuel from such energy sources. The other nations performed only slightly better than South Africa, with India at 3 per cent, China at 3.8 per cent and Russia at 8.2 per cent.

BRICS members have formed sub-groups such as the BASIC group (Brazil, South Africa, India and China) to discuss positions on climate change in preparation for the Conference of the Parties (COP) meeting under the United Nations Framework Convention on Climate Change (UNFCCC). Although the Russian Federation is not part of this group, the group has expanded into BASIC-Plus with official representation from key organisations of developing countries, including the G77+China. The 19th BASIC ministerial meeting took place on 10 October 2014 in South Africa.

3 RECOMMENDATIONS

3.1 General recommendations

- Investment in social infrastructure, including in health, education and science, should be considered by the national development banks and other regional development banks. Governments should also collaborate to attract private investors into these sectors.

- BRICS should develop cross-sectoral platforms that allow for experience-sharing and exchange of best practices in social policies. These platforms must also engage multiple stakeholders, including from the informal sector and civil society.
- BRICS is acutely aware of the lack of comparable data across the member countries that could assist in evidence-based policymaking. To remedy this situation, it is suggested that a social policy research centre be established and tasked with generating and collating primary and secondary data that could assist governments, civil society and the research community. Such data would also be useful in mapping successes and failures of policy interventions across BRICS and would allow member countries to learn from each other.

3.2 Social protection safety net programmes for all

To reduce poverty in all its forms, to ensure full and productive employment and decent work for all, and to reduce inequality among and within BRICS countries, it is recommended that:

- BRICS member states create and support policy frameworks and gender-sensitive development strategies that are pro-poor, to ensure that marginalised groups, unemployed youth, child-headed households and women are protected adequately;
- member states share best practices around successful institutional responses to the needs and interests of people living in extreme poverty, such as *Bolsa Familia* in Brazil;
- BRICS members participate in international discussions and actions through UN institutions such as the International Labour Organization (ILO) and the United Nations Development Programme (UNDP) to cooperate in the development of common standards and indicators to measure progress in achieving targets to address poverty, inequality and unemployment;
- furthermore, BRICS must continue to cooperate on a ministerial level in the area of social protection, to standardise the target indicators across BRICS and achieve the SDGs by 2030; and
- BRICS should conduct research to determine how the national development banks should target financing to strengthen social protection measures in BRICS and the respective regions of member states.

3.3 Education

To ensure that education goals are attained, ensure inclusive, equal and equitable education, and promote lifelong learning opportunities for all, it is recommended that:

- BRICS should continue to support the UN and its related institutions such as UNESCO and to participate in the finalisation of the formulation of the SDGs, which are still under discussion;
- BRICS must continue to cooperate on a ministerial level in the area of education to discuss standardising the target indicators across BRICS countries;
- furthermore, member states should develop relevant performance monitoring and evaluation systems to ensure that progress on education is documented;
- BRICS member states should conduct research to determine how the national development banks should target financing to address educational and vocational needs in BRICS and the respective regions of member states;
- the BRICS nations should develop a centralised approach for the sharing and collection of data regarding areas of development cooperation in the field of education. BRICS nations should work together to improve the quality of data collected, and to ensure that it is comparable;
- member countries need to respond to the dual needs of providing basic education and capabilities and skilling its workforces for the modern economy and technical sectors;
- In order to promote social justice and improve national competitiveness in the future, BRICS countries should place preschool education development in a more important strategic position. Governments of member states should continue to increase investment in preschool education to improve the level of its popularization and the quality of care and education so that all school-age children can enjoy good preschool education on a just base.
- members may promote and encourage the establishment of BRICS university networks, which could include innovative scholarship models. It is suggested that research forums are established in universities and centres across the BRICS countries to allow for greater cooperation in the education and research sector; and
- there is also a greater need to enhance cultural exchanges and mutual knowledge of the contemporary and traditional practices across BRICS nations. Innovative programmes should be instituted to allow for the dissemination of art forms.

3.4 Health

To ensure healthy lives and promote well-being at all ages, it is recommended that:

- BRICS should participate in the strengthening of cooperation and joint research forums in the WHO, in particular, as well as UNAIDS structures;
- BRICS must continue to cooperate on a ministerial level in the area of health and discuss standardising the target indicators across the BRICS countries;
- member states should conduct research to determine how the national development banks should target financing to ensure healthy lives and the well-being of citizens of BRICS and the respective regions of member states;
- the BRICS countries should consider fully implementing the TRIPS agreement with regards to compulsory licensing, parallel importation and local production of medicines and vaccines to treat HIV, TB and malaria;
- the number of pharmaceutical patents issued should be limited, by setting stricter criteria for what is patentable; Brazil has been successful in limiting the number of patents and can share with other BRICS countries the steps it took to achieve this;
- more research is required to investigate the social and economic determinants associated with higher risk of NCDs and mental disorders; therefore, the BRICS countries need to set a research agenda in this area and collaborate in conducting multi-country studies, which should be funded by the respective BRICS governments;
- the BRICS Ministries of Health should finalise the monitoring and evaluation tool for universal health coverage, which includes both communicable and non-communicable diseases. It will also allow the health impact of public policies to be monitored at national, regional and cross-country levels (BRICS, 2014);
- BRICS countries could endeavour to introduce a new health and nutrition survey that will collect data on fruit and vegetable intake, salt intake, amounts of consumed saturated fats and trans-fats and intake of processed high-energy foods high in fats and sugars;
- to obtain accurate data for planning purposes, items on alcohol consumption could be included in the health and nutrition survey undertaken every five years from 2016 (see above);
- the members could establish a BRICS Health Fund to research and respond to the challenges of non-communicable and communicable diseases prevalent in the respective regions of the member states; and

- nodal agencies in member countries must also coordinate on outbreaks (for instance, Ebola) and contagions.

3.5 Migration, urbanisation and infrastructure

To make cities and human settlements inclusive, safe, resilient and sustainable, and to ensure the availability and sustainable management of water and sanitation for all, it is recommended that:

- BRICS should continue to pursue solutions within the UN system and cooperation at a ministerial level in the area of human settlement and urban development to discuss technological and skills cooperation and transfer, and to learn from best practices within and across BRICS countries; and
- joint research should be conducted to determine how the national development banks should target financing to address infrastructural needs of BRICS and the respective regions of member states.

3.6 Climate change, ecological degradation and food insecurity

Addressing climate change to sustain food security and prevent hunger is essential. It is recommended that the BRICS countries:

- adopt policies that counter climate change; tensions brought about by food insecurity create political instability and must be addressed at domestic, regional and international levels;
- conduct research to examine the risks of climate change and their respective models in each BRICS member state and respective regions;
- cooperate and share ideas on new and innovative ways of developing in a sustainable manner. This can involve a 'just transition' to a low-carbon economy that responds to the varied and pressing needs in developing-world contexts, where social and environmental justice is mutually ensured and fosters a transition to a less energy-intensive and extractive economy through renewable energy, ecologically friendly building, improving public transport, integrated urban and rural planning, sustainable infrastructure development and agro-ecological food production to meet people's socio-economic needs;
- ensure the resilience of households and small-scale activities through a social-ecological economic development trajectory which strengthens local economies and increases their resilience to exogenous shocks;

- remove the large-scale subsidisation of wealthy farmers as a key requirement for enabling more people-centred approaches that can support and encourage small-scale farmers in a global system that currently works against their survival;
- build skills to migrate to a low-carbon economy. Here, unions can play a key role in motivating for skills development and transfer programmes that empower workers to embrace learning trajectories that improve their ability to participate in a low-carbon economy;
- further cooperate and pool their expertise to develop and exchange energy efficiency technologies as well as alternative renewable energy sources; and
- conduct additional training programmes and surveys concerning energy intensity and efficiency.

CHAPTER 4

PEACE AND SECURITY

PILLAR

BRICS member states are committed to a democratic and just polycentric world order founded on the rule of law, equality, mutual respect, cooperation, coordinated action and collective decision-making. This vision could be achieved by supporting political and diplomatic efforts to peacefully resolve global disputes.

1 OVERALL SCENARIO

The world is witnessing growing turbulence due to political, economic, social and conceptual discordances. In the realm of peace and security the aim of BRICS is to create a stable, safe and fair world order through peaceful diplomacy and multilateralism. As discussed in Chapter 2, the reform of United Nations (UN) institutions, in particular the Security Council, is an important first step to ensure a fair reflection and representation of the changed conditions and challenges of the 21st century and is essential to restore global confidence in the functioning of the UN system. Peace and stability can be achieved through cooperation and collaboration around existing national, regional and international peace and security initiatives, and by developing new strategies and mechanisms to ensure a secure future. The UN Charter states the need to "take effective collective measures for the prevention and removal of threats to peace, and for the suppression of aggression or other breaches of peace" (United Nations, 1945).

The aim of the UN is to maintain international peace and security through collective measures on behalf of the Security Council. The collective security system is incorporated in Chapter I and regulated in Chapters VI and VII of the UN Charter.

Reinforcing the UN role on peace and security, the BRICS Member States will continue their efforts to achieve lasting peace and security, working within the UN framework to draw attention to the human suffering arising from, and the destabilising effects of, national and regional conflicts.

It is evident that forging fruitful partnerships and a stronger global governance template requires cooperation between developed and developing countries. BRICS has a central role to play in this regard. Nurturing conditions for cooperation is crucial to construct a different global order where power is more diffused and

responsibilities are appropriately shared. BRICS will make efforts to create a situation where developed and developing countries can work towards a common understanding and build consensus for a peaceful world.

Interdependence is a reality of the global system. Through shared concerns and aspirations BRICS can help the UN to overcome the challenges to peace and security. The BRICS countries share a common view that multilateralism and a rules-based global governance architecture are the best guarantor for global and regional stability, and also provide a better framework for asserting common values and interests while upholding the principle of the sovereignty of nations.

2 CHALLENGES

2.1 Rule of law and a multipolar world

The current world order, a quarter of a century since the collapse of the bipolar system, remains unstable, unpredictable and at times chaotic. As acknowledged by the BRICS leaders in the Fortaleza Declaration, our world is "confronted with persistent political instability and conflict in various global hotspots and non-conventional emerging threats" (BRICS, 2014). A further cause for concern is the fact that not only international governance structures "show increasingly evident signs of losing legitimacy and effectiveness" (ibid.), but the situation when international law is ignored and replaced with ad hoc solutions and arrangements, and precedent law undermines multilateralism and a consensus-based model of cooperation between States.

BRICS fully supports the strengthening of a democratic, inclusive international system and the existing institutions and espouses international law to be observed in accordance with the principles of the UN Charter, which is based on the sovereign equality of States and mutual respect of all countries irrespective of their political, economic, social and ideological positions. Thus it is important to reiterate once again the BRICS countries' firm commitment to "reform of current institutions towards more representative and equitable governance, capable of generating more inclusive global growth and fostering a stable, peaceful and prosperous world" (ibid.).

The primary role of the UN Security Council is to maintain peace and security through peaceful dispute settlement or, in some cases, the imposition of sanctions and authorising the use of force. Discussions on reform of the Security Council have been multifaceted, including areas such as increasing overall membership, improving efficiency and streamlining processes. Chapter 2 discusses this matter. To be effective, it is important that BRICS articulates a collective voice on issues of global importance. BRICS must play an active role in matters of global political and economic governance and consistently keep close coordination on reforms. At the Fortaleza Summit, the BRICS countries highlighted "the need

for a comprehensive reform of the UN, including its Security Council" (ibid.), and China and Russia reiterated "the importance they attach to Brazil, India and South Africa's status and role in international affairs and support their aspiration to play a greater role in the UN". BRICS countries should consistently take a clear position on substantive reforms.

The interests of long-term stability require respect for international law as opposed to the use of force, as well as a consideration of the objective aspects of civilisational development: religion, culture and national legal tradition. In accordance with article 27 of the Fortaleza Declaration, BRICS leaders have already come up with a joint statement on their "commitment to the sustainable and peaceful settlement of disputes, according to the principles and purposes of the UN Charter" and condemned "unilateral military interventions and economic sanctions in violation of international law and universally recognized norms of international relations" (BRICS, 2014). They also emphasise that the five countries should promote "the unique importance of the indivisible nature of security, and that no State should strengthen its security at the expense of the security of others" (ibid.).

Because of this, BRICS countries are ready to work on establishing the regulations to offer long-term legal solutions, so as to avoid the short-term interest of re-interpretation of legal norms that enhance instability. Strict positivism, intrinsic to international legal doctrines of some BRICS countries, is well illustrated by their practical steps on the international arena throughout the 20th and the beginning of the 21st century. Thus one can conclude that BRICS nations have to actively join the process of strengthening the practical foundations of international relations. Primarily this concerns the elimination of contradictions between the legal framework of international law (article 38 of the Statute of the International Court of Justice) and States' decision to comply with them according to their national foreign policy. It is paramount to provide the international system with legal certainty. To counter a process of further violation of international law, BRICS, in the spirit of network diplomacy, could also rely on regular unions with the use of their economic, political, civilisational and cultural partnerships, the Eurasian Economic Union, the Shanghai Cooperation Organization, Mercosur, the Community of Latin American and Caribbean States, the South Asian Association for Regional Cooperation, the African Union, the Asia–Europe Meeting etc.

2.2 Crisis management and risk prevention

Analysis of the main trends in the field of military conflicts shows that since the 1990s, after the bipolar world order ceased to exist, the number of conflicts in the world has been steadily increasing (considering disputes – which involve States – and conflicts – which also comprise non-state agents). As a result the zone of

instability has been widening. It is possible that armed conflicts can escalate both horizontally (involving new States and regions) and vertically (increasing the scale and intensity of violence in the unstable areas). Any conflict under certain circumstances could lead to a local war, and then to a large-scale war.

Most acute disputes are, as a rule, those concerning vital national interests of the warring parties. These interests include state sovereignty, territorial integrity, social, political and strategic stability in the system of world community, access to the vital economic and strategic zones and communications etc.

There are currently two basic trends in the world: i) globalisation of the world economy, which increases the influence of transnational corporations, increases the interdependence of countries and thus makes conflicts more costly; and ii) a multipolar world, with the rise of new global players with their own interests and visions of the world.

It is, therefore, very important that Ministers of Foreign Affairs build up common principles of cooperation with regard to uniform ways of dealing with conflicts elsewhere, and create a consultation mechanism where they can coordinate their views.

It is worrying, in particular, that extremist forces try to achieve power and wealth by using national and religious factors and inflaming ethnic violence, aggressive nationalism and separatism, propagating various ideas of confrontation.

2.3 Military threats to BRICS countries

Military threats to BRICS countries may be divided into three categories: external, internal and trans-border. Trans-border conflicts risk escalating into more significant threats. Furthermore, trans-border terrorist movements in Africa also threaten the stability of a number of States and some key economic interests of BRICS countries. Trans-border threats also emanate from political instability in BRICS nations' neighbouring countries.

The current military-political situation near some of the BRICS nations' borders is fraught with large-scale armed conflicts that directly endanger their security. The regions of instability include Afghanistan, the Middle East and Ukraine. At the same time the level of external military threats for BRICS countries is assessed as relatively low. We should strive to protect the security of BRICS nations predominantly by using political and diplomatic measures, as provided by the UN Charter. Despite all the efforts made by the international community, it has not succeeded in developing an adequate strategy to oppose local and regional threats. External interventions in general appear to have been rather ineffective in solving ethnic and political conflicts, especially those of a trans-border nature. Moreover, it seems that interventions may aggravate the situation and delay a possible solution.

2.4 New types of weapons

New and emerging offensive weapon systems and defensive deployments pose dangers to global stability. These are largely not covered by existing treaties, they disrupt established balance of power and in specific cases, their operationalization could lead to conflict. Since the side, which first deploys these innovative systems, gets a first-mover advantage, we could witness a new arms race among the major powers.

Two specific categories of weapon systems are of particular concern. First, the Unmanned Combat Air Vehicles (UCAVs) and Unmanned Aerial Vehicles (UAVs) used for military purposes are now being rapidly deployed by various states. Their use and deployment needs to be brought under a legitimate international order and their export and proliferation needs to be managed through an international arrangement.

Second, new developments in Ballistic Missile and Ballistic Missile Defense systems and postures may disrupt the balance of power and the threat of unassailability of any nation could lead to fresh rounds of counter development and counter postures leading to new tensions. Such new developments in this space must also be brought under a suitable international regime and confidence-building measures must also be initiated.

Besides these, new and futuristic weapon systems based advancement in science may also pose a great threat to security and stability in the world. BRICS countries should develop a coordinated approach in creating an international framework that governs these new weapon systems and strengthens the regimes from the last century which are unable to manage these new developments.

Weapons on new physical principles may also pose a great threat to security and stability in the world. They include geophysical, acoustic, laser, genetic and physiological ("rays of pain") types of weapons. BRICS countries should take a consolidated stand in demanding to bring all these new weapons under international control.

2.5 Non-proliferation and disarmament

The BRICS members are committed to strengthening the global non-proliferation regime and to achieve the desired objectives of universal disarmament. BRICS expresses support to the general principles of the current international non-proliferation and export control. To this end, it undertakes to engage in exchanges and cooperation in the field of non-proliferation.

Peaceful use of nuclear energy is granted under Article IV of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and no limitation should be put on it, except for voluntary measures or in cases of violation of the treaty.

At the same time, the use of peaceful nuclear energy should be fully consistent with the provisions of the Treaty, and the right of States to have access to goods and technologies for peaceful use should be guaranteed. Significant exporters and users across the globe should be encouraged to join relevant export control regimes.

2.6 BRICS and the prevention of an arms race in outer space

Weaponisation of outer space is a serious issue for BRICS members that are among the top space powers (Russia, China and India accounted for 65 per cent of the world's space launches in 2013 and for a large proportion of the satellites in orbit). All of the countries of the group agree on the notion that outer space should remain non-weaponised and protected from attacks from Earth.

The BRICS countries should be ready to engage all of the key parties to promote these approaches. They should continue to support relevant discussions on the prevention of arms races in outer space, such as the Russian-Chinese Draft Treaty on the Prevention of the Placement of Weapons in Outer Space and the Use or Threat of Use of Weapons Against Outer Space Objects (PPWT), and welcome a wide discussion of the topic. BRICS members should develop a commom approach to governance of outer space and initiate formal and informal consultation with all other parties.

2.7 Countering international terrorism

At least three out of the five BRICS countries face a grave terrorist threat, with India and Russia among the top 10 countries affected by terrorism according to the Global Terrorism Index (4th and 9th places, respectively). China occupies 23rd place, while South Africa (111th) and Brazil (116th) are relatively safe from terrorism, the latter with zero occurrence (Institute for Economics and Peace, 2012).

The BRICS leaders have jointly condemned terrorism and have reiterated that there could be no justification whatsoever for any act of terror, be it based on ideological, religious, political, racial, ethnic or any other justification. BRICS must work to strengthen the role and centrality of the UN as the coordinator for international action. BRICS must work towards early implementation of the UN Global Counter-Terrorism Strategy.

In 2014 the Russian Federal Financial Monitoring Service initiated the establishment of the informal BRICS Council consisting of the heads of the five countries' delegations to the Financial Action Task Force (FATF). Further efforts by

relevant authorities of the BRICS countries to exchange experience and sensitive information should be considered.

All five countries express grave concern over the fact that terrorists increasingly use globalisation processes to promote their cause and inflict greater damages on peoples of the world. Among these instruments special attention should be given to the mobilisation of terrorist supporters through information and communication technologies, in particular the internet and other media.

2.8 Countering drug trafficking and international organised crime

In recent years drugs have evolved into a truly global phenomenon, with transnational drug crime becoming one of the leading illegal activities in the world. All the BRICS countries have a common problem in drug trafficking, and drugs are produced in the territories of three of them – India, China and South Africa – mostly cannabis and synthetic drugs. According to a UNODC (2011) report, India might supply up to 3 per cent of the global heroin market. Possessing a very sophisticated pharmaceutical industry, India also produces new psychoactive substances and different forms of ephedrine. China is among the main producers of acetic anhydride globally, which is one of main precursors for heroin production.

With regards to drug use, Brazil occupies second place in the world in cocaine consumption, with around 18 per cent of the world's volume going there. Different data suggest that between 3 million and 6 million Brazilians use drugs (Bradley, 2012). Russia is among the countries that suffers most. It occupies third place in the world in terms of drug use, with around 8.5 million people using drugs at least occasionally, and 630,000 heavy drug users registered officially. Around 100,000 people die of drug abuse annually. Russia is also the leader in heroin use in the world, with Afghan opiates supplying up to 30 per cent of the total drug market in Russia. China occupies third place in heroin use, with steady growth over the last years. India is the main heroin user in South Asia, occupying 8th place in the world. The trend in South Africa seems to be most alarming, with the number of drug users growing by 600 per cent over the last decade and currently representing up to 15 per cent of the total population (Sara, 2013). South Africa is among the leaders in cannabis use. In all five BRICS countries the use of synthetic drugs is growing, with youth being the most affected.

All five countries are also major transit countries for drug trafficking. Around 70 per cent of cocaine transit from Latin America to Europe goes through Brazil (UNODC, 2013). China is a drug transit country en route to North America. Russia is the transit country for Afghan drugs to Europe. South Africa is considered the most favoured transit point for cocaine going from the Andean States and heroin from Afghanistan to Europe (Federal Drug Control Service, 2012).

Thus it is clear that drug trafficking is a common problem for all the BRICS countries. While not all of them are drug producers, all five suffer from growing drug use and transit.

Meanwhile international experience demonstrates that cultivation of narcotic plants mainly occurs in regions affected by low levels of economic development and local armed conflicts and which are generally out of or very weakly under government control. This means that the problem cannot and should not be resolved merely by police enforcement measures.

Therefore, a reliable long-term solution to the problem of cultivation of narcotic plants should not only address the demand side in more advanced economies, but also ensure security and sustainable socio-economic development of the depressed regions. This multifaceted task requires effective international cooperation.

In 1998 the UN General Assembly addressed the world drug problem as a development issue in which prevention and elimination of cultivation of the illicit crop might be attained by supporting rural development and acknowledging the importance of sustained national economic growth.

Alternative development projects managed by the drug control community have achieved both development and drug control outcomes in specific geographical areas where more conventional development agencies are often not even present, despite the prevailing levels of poverty and conflict. Experience demonstrates that improvements in the income and quality of life of communities often accompany alternative development projects as levels of opium poppy or coca cultivation fall.

At the same time, in recent years many efforts by the development assistance agencies to reduce poverty, promote sustainable human development and improve the lives and livelihoods of those residing in illicit drug crop producing areas have often failed. Traditional development models such as "profit maximising for illicit drug farmers" do not work in this case.

Nevertheless, many alternative development projects still neglect the causal factors of booming drug economies, focusing mainly on crop substitution, so the main push factors for drug economies, such as violence, weak statehood and a deficient judicial system, and a lack of infrastructure and market access, are disregarded. The effect of such projects is that short-term, illicit drug cultivation increases, and poverty returns again after a couple of years. A wider process of economic and political development including State formation in areas of limited statehood is required to ensure a sustainable reduction in illicit crop cultivation. Alternative development programmes should be undertaken with a full understanding of the overall objectives of ensuring security, fighting corruption, building

the capacity of national governments and promoting comprehensive economic and social development.

In December 2013 the UN Guiding Principles on Alternative Development were adopted; they emphasise the need for an integrated, multidisciplinary, complementary and balanced approach based on the principle of a common and shared responsibility.

A comprehensive review of the existing models of alternative development programmes and development assistance programmes implemented in illicit drug crop producing areas is needed. A considerable overlap between alternative development and poverty eradication programmes makes this work even more urgent in view of the intergovernmental process on the post-2015 development agenda and the UN-led international cooperation against the world drug problem. This review can provide a platform for synergy between all key stakeholders in development and drug control communities, as well as experts and civil society representatives in the relevant areas of concern.

2.9 Information security and cyber security

Today the BRICS countries constitute one of the largest and most rapidly growing segments of the global internet community, accounting for 38 per cent of the world's internet audience. The total contribution of the internet sector to BRICS economies in 2013 topped USD 500 billion, and yet the forecasts say it will double by 2015.

TABLE 1

Country	Population (March 2014, millions)	Internet users (June 2013, millions)	Global ranking with regards to internet use	Internet connectivity (June 2013, %)	Share of world internet users (%)
Brazil	201,032	99,358	5	49.4	4.1
Russia	143,666	75,926	6	52.8	3.2
India	1,242,580	151,599	3	12.2	6.3
China	1,363,780	568,192	1	41.7	23.6
South Africa	52,981	20,012	25	37.8	0.8
BRICS	3,004,039	915,087		38.8	38.0

Source: Demidov (2014).

At the same time, these remarkable statistics only emphasise the under-representation of the BRICS nations in the field of global internet and cyber governance. Neither the global discussion on the transition of the oversight of critical internet functions nor the attempt to set global rules to stop uncontrolled government surveillance of the internet has been properly dealt with. In fact, none of the BRICS areas of cooperation, as represented by the BTTC "pillars", can be

truly successful without addressing information and communication technology (ICT) security issues, because finance, economic growth, security, science and education today are equally dependent on the internet and other ICTs (Orlov, 2014). The subject of ICT as an element for sharing knowledge and innovation is dealt with in Chapter 5 of this document.

The trans-border nature of the internet makes the BRICS format free from its most serious weaknesses such as clashes of regional interests and mismatches of geographically determined agendas. Instead, the internet brings BRICS countries and their stakeholders together, and this is a chance that should not be missed.

Acknowledging massive e-surveillance as a direct consequence of a systemic malfunction of the internet architecture in its present form might imply far-reaching technical consequences. Even ignoring policymakers and the issues of trust in international relations, this conclusion might trigger significant revision and update of the technical backbones of the internet. This includes the work of basic internet protocols (HTTP, TCP/IP) and traffic encryption standards.

Therefore, the Common Berthing Mechanism (CBM) implemented in the BRICS framework might be a good tool for responding to a number of information security issues. One example is leveraging the cooperation of Computer Emergency Response Teams (CERTs) (or creating a BRICS CERT or a BRICS Computer Security Incident Response Team (CSIRT) as a part of CBMs, which also helps to counter trans-border cybercrime and cyber terrorism.

2.10 Joint IT-infrastructure and internet projects

There is enough experience, technological background, financial resources and political leadership to move the agenda on ITC themes forward more dynamically. The BRICS countries must investigate means of increasing digital connectivity among the members states. Next steps might include major software development initiatives that might bring together market demands and certain policy imperatives for the BRICS countries. Therefore, the BRICS countries could join their human, financial and technological resources to develop better security standards for internet protocols, protected operating systems and applications.

In the Statement to the BRICS Summit in Fortaleza, Just Net Coalition experts identified four possible areas of synergies for BRICS nations in the ICT field, including "the development of new open Internet platforms and tools including in the areas like search, operating systems, data storage and cloud services given that they have the necessary skills, large internal markets and political motivation to break with the current mass surveillance and rent-seeking based business models"

(Just Net Coalition, 2014). Looping the issue back to e-surveillance, those joint activities might also include elaboration of not only protected internet protocols but also new cryptography standards and products, including market-oriented solutions for "civil cryptography".

2.11 Maritime security

While there is considerable difference between the five BRICS countries with regard to their maritime activities and the volume of their mercantile fleets, several of the countries have been affected by attacks by maritime pirates.

Thus far, not much substantive work has been conducted by BRICS to fight maritime piracy. At the international level, 2008 saw the UN Security Council unanimously adopt a resolution allowing States to send warships to Somali territorial waters. Among the BRICS nations, this right was exercised by China, India and Russia (Bellish, 2012). This resulted in 2012 seeing a lower incidence of pirate attacks (75 against 237 in the previous year). Nevertheless, this is not the best possible and rational solution to the problem – the costs of warship convoys are way too high. There is an estimated loss for the world economy in the range of USD 7 billion to USD 12 billion annually.

This problem is still lacking the legal framework to be effectively countered. Among the issues requiring answers is how to release hostages and cargoes captured by pirates; what the procedures to punish those involved in piracy should be, and whether there are means to ensure the effective prevention of pirate activities.

As a future-oriented approach BRICS should address the issue of ocean governance and hold consultations thereon.

2.12 Illegal migration

While BRICS brings together five of the largest emerging economies, the countries' socio-economic structures and the dynamics and goals of economic development differ drastically, complicating the formulation of any coherent common policies, including in the area of migration.

Migration represents one of the critical issues for all BRICS members. They have a number of common problems and policy goals, even though their migration challenges vary significantly.

The problems of illegal immigration and human trafficking articulate other issues, related to immigration and frequently widely publicised and not infrequently exaggerated by the media, government authorities and political activists.

In general, both immigration and emigration represent highly controversial issues causing serious contradictions within the receiving societies. In those countries where immigration in highly dynamic there are even fears of the erosion of the local cultures and the ethnic and religious unity of the receiving societies, the influx of the undocumented migrants existing in a legal grey zone, the growing pressures on the labour market and social services, the loss of funds through the migrants' remittances to their home countries, the proliferation of crime and corruption as well as national security threats. Chapter 3 discusses some of the social aspects related to migration.

All five BRICS countries are also facing serious problems related to human trafficking, a phenomenon that might stimulate the proliferation of organised crime, corruption and several types of exploitation of human beings. Human trafficking is also increasingly associated with drugs and the smuggling of weapons, offering new potential channels for the financing and movement of terrorist groups.

3 RECOMMENDATIONS

3.1 On the rule of law in a multipolar world

Establish a legally consistent definition for international terrorism. Define a clear legal approach to participants in a range of conflicts, creating conditions for their protraction and a global convention on the fight against terrorism under the auspices of the UN.

Improve the definition of the status of combatant and non-combatant with regard to military conflict; issues of humanitarian limitations to economic and other sanctions levied by the international community; a clearer definition of "indirect aggression"; and regulation of drone activities.

Create a specialised BRICS legal forum or a commission on international law for regular consultation on the most urgent international issues, and thus strengthen international law by embracing other views, cultures and traditions.

Share and popularise the theoretical and historical heritage of BRICS countries' historians, philosophers and experts in international law, to prevent trends of re-writing the history of the 20th century.

Provide for joint BRICS initiatives in the area of the codification and development of international law in relevant committees, commissions and other structures of the UN and other international organisations.

BRICS countries may consider establishing a regular forum to discuss matters of arms control and non-proliferation.

BRICS members might work towards a common position supporting firmly the principle of non-weaponisation of outer space and work closely in the framework of the UN Committee on the Peaceful Uses of Outer Space. Non-weaponisation of outer space should be brought to the top of the agenda of the Conference on Disarmament. Consultations must be institutionalised on new areas of governance including outer space and the oceans.

3.2 Crisis prevention

BRICS should adhere to international law and recognise the UN and its Security Council as the primary and only legitimate global institution with the responsibility of enforcing peace and security, based on the principle of collective security.

BRICS should abstain from the use of force or threat of force and use diplomatic means in the resolution of international conflicts.

BRICS should adopt the principle of impartiality and thorough investigation of the roots and causes of conflict, to suggest the best possible solutions, involving the interests of all parties to the conflict.

BRICS must evolve as a platform for creating contextualised multilateral policies, with mutual consultations taking place via diplomatic negotiations by Foreign Ministries to develop viable and credible mechanisms to respond to local, regional and international political and social turbulence. BRICS might consider enhancing cooperation with relevant regional and global structures in which its five member countries are involved.

A mechanism of consultation and cooperation should be introduced, involving relevant leading centres of research and expertise, to offer opinion based on analysis of the given situation.

3.3 On terrorism

All five BRICS countries could and should play a role in the establishment of a universal definition of terrorism and the adoption of the UN Comprehensive Convention on International Terrorism. Based on recommendation from the Financial Action Task Force and further documents, adopted under the auspices of the UN, BRICS should deepen cooperation to exchange information on the financing of terrorist groups and prevent the free flow of financing for terrorist and other illegal trans-border activities.

BRICS should strengthen cooperation between relevant law enforcement agencies to exchange information and provide mutual assistance in the pursuit of

criminals fleeing prosecution for terrorist activities, and establish a joint monitoring system over those suspected of involvement in terrorist activities. It might be deemed necessary for BRICS to provide ad hoc cooperation on joint investigation of terrorist activities in BRICS countries, with a commitment to extradite terrorists plotting or implementing terrorist acts in any of the BRICS countries.

3.4 Countering drug trafficking

BRICS should promote regular exchanges of best practices by the relevant anti-drug agencies of the BRICS countries. They should jointly develop recommendations aimed at improving national legislation and the efficiency of legal cooperation between the countries with regard to illicit drug trafficking.

BRICS needs to consider the establishment of regular multilateral consultation mechanisms, involving also Latin American and Central and West Asian countries, to exchange best practices in the fight against drug trafficking. BRICS nations should establish at the national and multilateral level common educational programmes to promote a drug-free society through schools, universities and community centres, targeting youth in particular. This could be among the tasks for a future BRICS university network with regard to raising public awareness of the issue.

BRICS should promote collaboration between the relevant health, anti-drug, youth and other agencies and ministries so as to foster the development of social inclusion programmes and promote healthy lifestyles, to prevent further expansion of drug use nationally.

BRICS should develop joint projects on social advertising to counter the further expansion of drug use through traditional (newspapers, TV, radio) and social media.

BRICS should support the UN Guiding Principles and provide a contribution to the UN General Assembly Special Session on the World Drug Problem to be held in early 2016.

Alternative development issues with a focus on best practices, existing mechanisms, obstacles, desirable outcomes and performance indicators could be explored by the development banks of the BRICS countries together with the United Nations Office on Drugs and Crime (UNODC) and the World Bank. BRICS should also strive for the results of this review to be incorporated into the post-2015 development agenda.

BRICS should conduct joint research into the extent of the drug problem and recommend interventions to address it.

3.5 Information security and cyber security

BRICS should offer a consensus-based vision of a new global internet governance architecture. BRICS has the full potential to raise its voice on behalf of emerging economies in the WSIS+10 Summit – a milestone event which is going to take place at the end of 2015.

BRICS might take on the task of developing a set of principles for internet governance, which might include government e-surveillance and the responsibility of States for conducting it, the right to internet access, and the internationalisation of internet governance, implying international and multi-stakeholder control over the internet's critical functions,

BRICS should also help shape a reformed global regime that allows international cooperation and inter-governmental coordination on cybercrime, theft, fraud and other illegal trans-border activities that take advantage of the internet.

BRICS members should coordinate research on new media, technology, the internet and its influence on society, democracy, citizenship and the social order.

The mechanism and mandate of the Internet Governance Forum (IGF) might be developed and transformed to establish a permanent IGF Executive Secretariat that would work on a multi-stakeholder basis under the auspices of the UN on the key goals and issues of the global internet governance agenda.

The BRICS nations could facilitate the establishment and work of a research committee on the fundamental risks of the internet governance architecture in the framework of the IGF Executive Secretariat (or within some other UN-based multi-stakeholder framework), to produce a report with recommendations to international policymakers and the global technical internet community (Internet Society (ISOC), IETF, Internet Architecture Board (IAB), regional registries etc.).

BRICS countries could build confidence in the use of ICTs by means of agreements on CBMs in the area of cybersecurity, including between their CERTs.

In addition to sharing information on major abnormalities in trans-border traffic and cybersecurity incidents, parties to the CBMs agreements and BRICS countries could join forces to monitor cyber espionage and e-surveillance campaigns targeted at their territory and infrastructure by third parties.

3.6 Maritime security

BRICS countries should pay primary attention to the modernisation and improvement of national legal systems and international criminal law on maritime issues.

BRICS countries could consider the creation of a joint or shuttle system of commercial fleet convoys.

It might also be necessary to set up a BRICS training centre to combat illegal pirate activities in the open seas both at tactical level with exercises, and operational level through regular meetings of relevant agencies. This should help to build the capacities of BRICS members and other partner countries and organisations.

3.7 Illegal migration

BRICS countries should exchange best practices with regard to border surveillance.

BRICS countries should make efforts to provide basic conditions to identify migrants.

BRICS would do well to operationalise and implement the recommendations of the Convention against Human Trafficking.

BRICS nations should undertake specific studies in their respective regions to map the drivers and determinants of regional migration and possible responses.

CHAPTER 5

PROGRESS THROUGH SHARING KNOWLEDGE AND INNOVATION

PILLAR

To enhance cooperation between and among member states and to capitalise on comparative advantages, BRICS should commit to investing greater effort and resources to increase joint research among member states. It is, therefore, important to support intra-BRICS knowledge production and dissemination and to facilitate researcher and student exchange.

BRICS should aspire to nurture world-class research institutions and education facilities that can make a significant contribution to global education and knowledge systems.

1 CURRENT SITUATION

Over the past two decades China and India have experienced fast economic growth, based, among other factors, on high levels of capital accumulation. During the early 2000s Brazil, Russia and South Africa benefited from increased demand for commodities and also experienced growth. The emergence of BRICS countries brought international attention to several aspects of their social, political and economic environments. This interest is also reflected with regard to technological development.

BRICS countries' recent scientific and technological developments have positive and negative aspects. On the one hand, the countries saw significant progress in their science, technology and innovation (STI) input and output indicators (see Table 1). Brazil and India, for instance, almost doubled the number of their scientific and technical publications between 2000 and 2009, while China quadrupled the number of its publications in the same period. This increasing number of publications results in a significant participation of BRICS countries in the scientific production of areas such as material sciences, chemistry and physics (see figure 1).

China was able to increase its share of total Triadic patent families from 0.2 per cent in 2001 to 2.2 per cent in 2011, while the figures for India were 0.2 per cent and 0.4 per cent for the same period. China was also able to increase its gross domestic expenditure on research and development (GERD) as a percentage of Gross Domestic Product (GDP) from 0.6 per cent in 1996 to almost 2 per cent in 2012 (see figure 2).

Education is also showing some positive indicators. Gross enrolment in tertiary education increased in BRICS countries, as can be observed in figure 3. The Russian Federation is showing very high percentages, but figures are improving for the other countries.

Despite all this progress, BRICS countries still lag behind richer countries in important variables. As shown in figure 4, even China, which has the largest GERD as a percentage of GDP among BRICS countries, is still far behind countries such as South Korea, Sweden and Japan. Only Russia has a significant number of researchers per thousand workers.

Table 2 shows that Russia, India and especially China managed to improve their total factor productivity (TFP). Nevertheless, the level of TFP in these countries as a percentage of US levels is still very low, showing that there is a long way to go with respect to increasing productivity. Similarly, figure 5 illustrates that, despite China's and India's progress, BRICS countries' share of Triadic patents is still very low. China is the only BRICS country that has a high share of its exports originating from high-tech products (see table 3).

Two clear conclusions emerge from the figures presented above. First, among BRICS nations, China is the leading performer in STI indicators. Overall, its STI and productivity indicators have grown faster than other BRICS countries, in line with the growth of its economy. Due to the size of its population and GDP, China may lag behind in some indicators that consider these variables in their denominators, as shown in Figure 4. Nevertheless, in absolute terms, China is among the world leaders in variables such as the number of people employed in research and development (R&D) activities, and R&D expenditures.

Second, despite the progress in some indicators such as the number of scientific publications, there is still much room for improvement when compared to the most technologically advanced countries.

At this point, it is worth introducing some conceptual aspects to the discussion. First of all, there is a consensus that scientific and technological developments are positively associated with growing productivity. How is it possible to improve in this area? Countries that excel in technology have more mature National Innovation Systems (NISs). A NIS represents a set of institutions involved in STI creation – notably government, universities and research institutes, and firms – and the knowledge that flows between them. In a mature NIS there is a smooth flow of knowledge, with highly innovative firms – competitive in global markets – generating technologies in their own research laboratories or in partnerships with universities and research institutions. Innovations are introduced to the market to solve specific technological or non-technological problems and especially due to competitive pressures. There is integration and coherence between STI initiatives and other policies: economic, environmental, educational, industrial etc.

It is natural that BRICS countries have not reached this situation. History plays an important role in the development of a country's NIS. Brazil, India and South Africa's colonial pasts influenced the way their NISs developed. Similarly,

the past of planned economies was also important for the development of China's and Russia's NISs. As would be expected, the deep social, economic and political changes that Russia and South Africa faced in the 1990s also affected the way in which these two countries reorganised their NISs. Russia, Brazil and South Africa are highly dependent on primary or resource-based products.

These are examples of factors that hindered the development of a mature NIS in BRICS countries. Nevertheless, despite all the odds, these countries have shown considerable progress, and even some success stories of domestic firms being able to compete in high-tech markets. The following sections will illustrate some of the achievements made by BRICS countries and also some of the challenges they still face.

This report is structured as follows. Section 2 will present the general features of each BRICS country's NIS, including the main actors as well as the regulatory and policy framework. The section also includes a table with the distinguishing features, key accomplishments and main challenges of each NIS. Section 3 presents the main challenges BRICS countries face in common with regard to their NIS. Section 4 presents successful international experiences of cooperation and knowledge sharing. Finally, Section 5 presents proposals for specific actions to be undertaken in respect to promoting cooperation and knowledge sharing.

Due to editorial limitations regarding the length of the document, there is no ambition to provide an exhaustive list of actors, policies, challenges and statistics for BRICS countries. For further information, there are a number of recent studies that can be consulted.[1]

1.1 General features of BRICS National Innovation Systems

This section presents general features of each BRICS country's NIS, including the main actors – parliament, government and intermediary agencies, academia and higher education system, research institutes, enterprises – as well as regulatory and policy framework – the main recent plans and programmes, financial and tax mechanisms and relevant legislation.

1.1.1 Brazil

Brazil experienced a late development of its universities and also a late industrialisation process. Despite this disadvantage, the country managed to develop a complex innovation system.[2] Brazil has a post-graduate and research system that produces an increasing number of doctoral graduates and scientific studies. Brazilian STI policies

1. See, for instance: OECD, 2014c; Cassiolato & Vitorino, 2009a; Kahn, Melo & Matos, 2014; Arroio & Scerri, 2014; Scerri & Lastres, 2013; and Cassiolato et al., 2014b.
2. See: <http://goo.gl/OnI2jv>, p. 18.

have traditionally focused on academia, based on a linear model of innovation, with little interaction with the business sector. Only in the past 10 years there has been greater emphasis on the promotion of innovation in enterprises. During this period, there has been an improvement in the integration of innovation policies and in the interaction among agents such as Financiadora de Estudos e Pesquisas (FINEP)[3] and the Brazilian Development Bank[4] (Banco Nacional de Desenvolvimento Econômico e Social – BNDES). Integration of innovation policies with other policies has also improved, but there is much room for improvement.

With regard to the productive sector, performance is ambiguous. The Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuária – Embrapa) and other research institutes have helped Brazilian farmers to achieve increasing levels of productivity,[5] and Brazil has become an agribusiness power. On the other hand, the industrial and service sectors face stagnant levels of productivity and relatively low indicators of innovation when compared to developed nations. STI investments are deeply dependent on government spending. Three of the most successful cases related to STI in Brazil were the result of governmental initiatives: Embrapa, Embraer and Petrobras.

Main actors in the National Innovation System

Parliament

Brazilian Congress comprises the Senate (with representatives of each of the states) and the Chamber of Deputies (with representatives of the citizens). Both have standing committees that deal with science and technology.

Government and intermediary agencies

The Ministry of Science, Technology and Innovation[6] (Ministério da Ciência, Tecnologia e Inovação – MCTI) and its financial agency, FINEP, are at the core of the Brazilian NIS. However, the Ministry of Education, Ministry of Development, Industry and Trade (MDIC) and BNDES also play a relevant role. Other ministries that also participate include the Ministry of Agriculture, Livestock and Food Supply (MAPA), Ministry of Defence, Ministry of Health, Ministry of Communications and the Ministry of Mines and Energy. The Ministry of Finance is also consulted on subjects related to spending resources.

Brazil has 26 states and the Federal District (Brasília). Each one of these 27 federal units may develop its own STI policy and structure. The most relevant

3. Financiadora de Estudos e Pesquisas was founded in 1952.
4. Banco Nacional de Desenvolvimento Econômico e Social was founded in 1952.
5. Productivity is quite low in family agriculture.
6. Ministério da Ciência, Tecnologia e Inovação was founded in 1985.

state programmes are in the Southeast and South regions. São Paulo, the richest state, invests at least 1 per cent of its tax income in the Foundation for Supporting Research of the State of São Paulo (FAPESP). São Paulo state also has its own Institute for Technological Research (IPT) and Agronomical Institute (IAC).

At a national level, besides FINEP, there are a number of government agencies participating – to varying degrees – in the NIS: the Brazilian Agency of Industrial Development[7] (Agência Brasileira de Desenvolvimento Industrial – ABDI), Centre for Strategic Studies and Management in Science, Technology and Innovation[8] (CGEE), National Commission for Nuclear Energy (CNEN), Brazilian Space Agency (AEB), National Institute of Industrial Property (INPI), National Institute of Meteorology (INMET), National Institute of Metrology and Quality (Inmetro), National Telecommunications Agency (Anatel), National Electric Energy Agency (Aneel), National Oil Agency (ANP), National Health Surveillance Agency (Anvisa) and the Institute for Information in Science and Technology (IBICT).

Academia and higher education system

Brazil has 67 universities directly funded by federal government. Furthermore, most of the 26 states fund local universities named state universities. Likewise, there are more than 2,000 private post-secondary education institutions. Most of the research is conducted in government and confessional universities. Academic societies – such as the Brazilian Academy of Sciences (ABC) and the Brazilian Society for the Progress of Science (SBPC) – are different from their Chinese or Russian counterparts. The ABC and SBPC are civil societies, bringing together scientists from diverse institutions, especially higher education institutions (HEI).

There are two federal post-graduate research support agencies: the National Council for Scientific and Technological Development[9] (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq), linked to the MCTI, and the Coordination for the Improvement of Higher Education Personnel[10] (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Capes), linked to the Ministry of Education. Capes is also responsible for the evaluation of post-graduate programmes in universities. State agencies, such as Fapesp, have their own support programmes. The National Institute of Educational Studies and Research Anísio Teixeira (Inep), linked to the Ministry of Education, conducts an exam for incoming students (ENEM) and HEI graduates (Enade) as part of its role in the National System of Evaluation of Higher Education (Sinaes).

7. Agência Brasileira de Desenvolvimento Industrial was founded in 2004.
8. ABDI and CGEE are para-public organisations.
9. Conselho Nacional de Desenvolvimento Científico e Tecnológico was founded in 1951.
10. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior was founded in 1951.

Research institutes

The Brazilian Industrial Research and Innovation Corporation[11] (Empresa Brasileira de Pesquisa e Inovação Industrial – Embrapii) was created in 2013. It aims to promote R&D cooperation between firms and research institutes, for the development of innovative products and processes. There are a number of other governmental institutes, such as: the National Institute of Space Research (Instituto Nacional de Pesquisas Espaciais – INPE), which aims to develop science and technology in space and terrestrial areas of knowledge; the Oswaldo Cruz Foundation (Fiocruz) and the National Cancer Institute José Alencar Gomes da Silva (Inca), linked to the Ministry of Health; and the Aerospace Science and Technology Department (DCTA), the Technological Army Centre (Cetex) and the Institute of Marine Research (IPqM), which are linked to the Ministry of Defence.

Brazil has a network of research institutes, linked to universities, in the areas of agriculture, energy, engineering and information technology, exact and natural sciences, human and social sciences, ecology and environment, nanotechnology and health.[12] These institutes collaborate with the Brazilian System of Technology (SIBRATEC), which arranges finance to create a favourable environment for technological innovation in enterprises.

Since 1991 there have been fiscal incentives for R&D in the electronics sector (through the Information Technology Law). This was a great incentive for the establishment of several information and communication technologies (ICT) research institutes, many of them linked to foreign companies. The country also has several agronomical institutes.

Enterprises, technoparks and special economic zones

Embrapa is a company linked to Mapa, devoted to developing a model of genuine Brazilian tropical agriculture and livestock. Embrapa's technology helped incorporate a wide area of degraded *cerrado* (savannah) lands into a region that now accounts for nearly 50 per cent of Brazilian grain production. Embrapa also helped Brazil to multiply its production of animal protein. There are four public companies linked to MCTI: Indústrias Nucleares Brasileiras (INB),[13] Nuclebrás Equipamentos Pesados (NUCLEP),[14] Alcântara Cyclone Space (ACS)[15] and the Centro Nacional de Tecnologia Eletrônica Avançada (CEITEC).[16]

11. Empresa Brasileira de Pesquisa e Inovação Industrial is a para-public organisation.
12. See: <http://goo.gl/Dpt0zF>.
13. Indústrias Nucleares Brasileiras acts in the uranium productive chain, from mining to production of the fuel that powers the reactors in the nuclear plants.
14. NUCLEP produces heavy components for nuclear power plants.
15. A binational Ukrainian-Brazilian company created for development and operation of the Alcântara Lauch Centre in Brazil.
16. Centro Nacional de Tecnologia Eletrônica Avançada works in the development and production of integrated circuits for radio frequency identification and specific applications.

Petrobras is an oil company controlled by the Brazilian government. It owns the Leopoldo Américo Miguez de Mello R&D Centre (Cenpes), located on the campus of the Federal University of Rio de Janeiro (UFRJ). Cenpes was crucial to the exploration of oil on the continental shelf offshore and in deep sea. The discovery of large oil reserves in the pre-salt layer turned the technopark located at UFRJ into a very active one, attracting R&D centres from several multinational corporations. The Brazilian Association of Science Parks and Business Incubators (Anprotec) has approximately 280 members.

Several firms have their own R&D laboratories.[17] In Brazil, about 47 per cent of R&D spending is made by the business sector,[18] and the manufacturing business associations are active in STI discussions. The National Confederation of Industry (CNI) sponsors an innovation prize and regularly publishes reports with recommendations regarding STI policies. Innovative firms created the National Association for Research, Development and Engineering of Innovative Firms (ANPEI). Brazil has a special economic zone in Manaus, in the Amazon region, but it has an emphasis on regional development.

Regulatory and policy framework of the National Innovation System

Main recent plans/programmes

Since 2003 the federal government has developed three industrial policies, all of which contained actions related to innovation. The most recent science and technology plan is the National Strategy of Science, Technology and Innovation 2012-2015, which establishes the following priority areas and technologies: ICTs, the health industrial complex, oil and gas, defence, aerospace, nuclear, biotechnology, nanotechnology, green economy (renewable energy, biodiversity, climate change, oceans and coastal zones) and science and technology for social development.[19]

Science without Borders (CsF) is a programme developed by a partnership between the MCTI, the Ministry of Education and the private sector, promoting international exchanges for Brazilian undergraduate and graduate students at foreign universities. The focus is on technology-related areas.

The National Knowledge Platforms Programme is a recent policy that aims to stimulate partnerships between enterprises and scientific and technological institutions to jointly resolve specific complex technical problems in the development of innovative products or processes.

17. For a survey of manufacturing and selected service sectors. See: <http://goo.gl/m44967>.
18. See: <http://goo.gl/XtnFvX>.
19. Brazil has a Four-Year Plan established by the Constitution.

Inova Empresa is also a recent plan aimed to boost investments in innovation, including projects with greater technological risk, and to strengthen the links between enterprises, research institutes and government. The target areas are: agroindustry, energy, oil and gas, health, aerospace and defence, ICTs and sustainability. FINEP and BNDES are the main operators of *Inova Empresa*. For other programmes, see Araújo (2013).

Financial and tax mechanisms

Sectoral funds are the main financial mechanisms to finance scientific research in Brazil. They were created in the late 1990s to provide a stable source of resources for R&D. They are administered by FINEP, which also operates with credit and economic subsidies. BNDES runs an innovation credit operation and also has know-how in financing sectors with a high proportion of intangible assets, such as software.

Since the end of the 1990s there have been a number of private and governmental venture capital and private equity initiatives, but there is still much room for development. The Brazilian Private Equity & Venture Capital Association was founded in 2000, and the Brazilian Startups Association (ABStartups) was founded in 2011. For other financial and tax mechanisms, see Araújo (2013) and De Negri and Kubota (2008). As mentioned before, states may have their own financial and tax subsidies.

Relevant legislation

The main laws related to innovation are: Law 10.973/2004 (innovation), Law 11.196/2005 (tax incentives); laws with incentives for ICT: Law 8.248/1991, Law 10.176/2001 and Law 11.077/2004; Law 11.105/2005 (biosafety); Decree Law 1.982/1982 and Law 10.308/2001 (nuclear activities); Interim Measure 2.186/2001 (genetic heritage); Law 11.794/2008 (use of animals in scientific experiments); Law 9.112/1995 (sensitive items); Law 9.610/1998 (copyright); Law 9.279/1996 (brands and industrial property); and Decree 8.269/2014 (knowledge platforms). For a description of some of these laws, see Koeller and Gordon (2013).

1.1.2 Russia

"Russia has an important innovation potential, with high tertiary education rates, a large science base inherited from the Soviet Union, strong positions in some science and technology fields and a government that recognizes the importance of innovation" (OECD, 2014b: 118). Despite these positive characteristics, there remain significant challenges, such as: low demand for innovation from enterprises; a relatively low level of investment by businesses; institutional imbalances (a high concentration of R&D in large firms, especially state-owned enterprises and research institutions, the weak role of universities) etc.

The Russian Federation has a mission-oriented science and technology system, and only at the end of the 20st century did the importance of STI and an understanding of the NIS as a wider system of national institutions gain the State's and society's attention. To understand the current Russian NIS, it is important to take into consideration the strong negative impacts of the transition from a planned to a market economy.[20] Over the past few years innovation has been a major political priority. In the 2000s the Russian Federation experienced an overall growth in the national economy and labour productivity, and its service sector developed faster than in any Organisation for Economic Co-operation and Development (OECD) member country (OECD, 2014c: 244). The level of support for science and innovation and the pace of transformation in this sphere increased.

Since 2013 the conditions for implementation of the state innovation policy and the development of the NIS in Russia have been considerably complicated by macroeconomic and geopolitical issues. However, the government intends to continue to support STI, including by optimising the mechanisms and structure of resources for this support.

Main actors in the National Innovation System

Parliament

The State Duma (*Gosduma*) is the lower house of the Federal Assembly of Russia, the upper house being the Federation Council of Russia. They participate in the development of innovation policy through different committees and working groups (for example, the Committees of the Federation Council on Education and Science, on Industrial Policy, on Information Policy; the Committees of the State Duma on Science and High Technology, on Industry, on Information Policy, on Information Technology, on Communications, on Education); organise discussions in expert councils; and are engaged in legislative activity.[21]

20. In the Soviet Union the R&D expenditures in relation to GDP varied from 3 per cent to 4 per cent. Even in 1990, 2 per cent of GDP was spent on R&D. The number of researchers as a proportion of the economically active population was one of the highest in the world: 200 R&D personnel per 10,000 employees. An active regional policy was developed. The Soviet republics had academies of sciences, universities and large R&D centres. In 1989 the Soviet R&D sector had more than 4600 organisations including research institutes, design bureaus, HEIs and enterprises. After the collapse of the Soviet Union, the Russian S&T system faced a severe crisis, and S&T indicators decreased significantly. Gross domestic R&D expenditures (GERD), for instance, fell by 75 per cent at constant prices between 1990 and 1995. During this period, industry output declined by almost 50 per cent. This situation had a severe impact on the national S&T system (Kuznetsova, 2013). Until the late 1970s scientists and university teachers had high salaries (by Soviet standards) and prestige in society. The reliance on permanent support from the government and the deterioration of researchers' material situation explains why a large proportion of the scientific community resisted the market reforms of the early 1990s. Given that entrepreneurial behaviour and market-style activities were discouraged until 1991, it is unlikely that people's attitudes have completely changed despite extensive market reforms (Klochikhin, 2014).

21. See: <http://goo.gl/fNzRKf>.

President

Given the significance of science and innovation for economic growth, in 2012 the President of the Russian Federation signed several key decrees directly dealing with STI. The decrees form a long-term strategy, defining appropriate objectives, priorities and target indicators for STI. Among these are the decrees: "On long-term economic policy" (No. 596), "On measures to implement state policy in the field of education and science" (No. 599), and "On measures to implement state social policy" (No. 597). Practical implementation of the decrees is carried out by the government and other authorities.

Government and intermediary agencies

In Russia, state control and intervention in the NIS (especially in STI) are widespread, by means of direct state ownership, budget financing and control over economic activity (OECD, 2011a: 28; Gokhberg and Kuznetsova, 2011). The Ministry of Education and Sciences is responsible for the science and technology (S&T) sector as a whole and the development of appropriate legislation. The Ministry for Economic Development is responsible for R&D components in different sectors of the national economy (through major goal-oriented programmes, big projects and other initiatives) and overall economic and business legislation. These two ministries are jointly responsible for technology implementation zones, venture funds, innovation territory clusters, technological platforms, the development of breakthrough (critical) technologies etc.

The Ministry of Information Technologies and Communication and the Ministry of Education and Sciences are responsible for the creation of innovation infrastructure etc. Certain expenditures not related to programmes are administered by the Ministry of Finance, whose Departments of Budgetary Policy and Regulation in the Public Sector and Science are responsible for policy and legal regulation of relative financial inventions. The Federal Agency for State Property Management manages the property of federal R&D organisations (Kuznetsova, 2013). The Federal Agency for Research Organisations (FARO, established in 2013) administers the property and evaluates and oversees the activities of the Russian Academy of Science institutes and distributes public funding to them.

A variety of advisory bodies (councils and commissions) work under the auspices of the President and the Government of Russia on a wide range of issues related to the modernisation and diversification of the national economy on the basis of the development of modern technologies and innovations. They combat violations of intellectual property rights, define rules for their legal protection and use, develop policy proposals in the fields of high technology and innovation, big national projects and initiatives, interaction between authorities of different levels in the NIS (federal, regional, sectoral), NGOs, research organisations, universities etc.

The Russian Foundation for Basic Research supports the scientific and technical potential of the country and provides Russian scientists with financial support through competitive funding mechanisms on the basis of expert estimates.[22] The Russian Foundation for the Humanities supports research in the humanities and the dissemination of humanities knowledge in society.[23] They are state foundations. The Russian Scientific Foundation (set up in 2013 as a non-profit organisation with huge initial funding from the government) distributes special grants for advanced research projects at research and education centres, for young talents and highly skilled professionals (scientists, teachers, post-graduate students), for Russian scientists returning from abroad etc.

The Federal State Autonomous Institution "Russian Foundation for Technological Development" assists in the implementation of state policy in the area of science and technology. In collaboration with technology platforms, it performs scientific and technological, legal, financial and economic expert analyses of the innovation projects and finances prospective R&D activity based on the results of tenders.[24]

The Fund for Assistance to Small Innovative Enterprises in Science and Technology (FASIE) is a state non-profit organisation. Its activities are coordinated by the Supervisory Board, approved by the Government of the Russian Federation.[25]

The Russian Foundation for Advanced Research Projects is an advanced military research agency tasked with informing the country's leadership on projects that can ensure Russian superiority in defence technology. It analyses the risks of any Russian technological backwardness and technological dependence on other powers.[26]

The Federal Service for Intellectual Property (Rospatent) is a federal executive authority (within the structure and under the jurisdiction of the Ministry for Economic Development) performing control and supervision functions in the area of the legal protection and exploitation of intellectual property rights, including patents and trademarks.[27] The main responsibilities of the Federal Institute of Industrial Property include preparatory work for the implementation of Rospatent legal actions related to the legal protection of the results of intellectual activity and the means of individualisation: inventions, utility models, industrial designs, trademarks and databases.[28]

22. See: <http://goo.gl/VHz0SE>.
23. See: <http://goo.gl/x34sbM>.
24. See: <http://www.rftr.ru/en/>. From 2014, the Development Foundation for Industry.
25. See: <http://www.fasie.ru>.
26. See: <http://www.fpi.gov.ru>.
27. See: <http://www.rupto.ru/en_site/index_en.htm>.
28. See: <http://goo.gl/gGMVuc>.

Academia and higher education systems

In 2013-2014 there were 969 higher education establishments in the Russian Federation, attended by about 6 million students. About 70 per cent of them are engaged in R&D and innovation activities to a varying degree and with varying effectiveness. The 29 national research universities represent a new institutional form of organising scientific and education activity[29] (HSE, estimates).

More than half of the Russian labour force is educated at tertiary level. Russian performance is better than the OECD average in terms of literacy, and similar to the OECD average in terms of numeracy. On the other hand, Russians do worse in using ICT tools efficiently and effectively solving problems that arise in everyday life (OECD, 2014b).

Historically the Russian Academy of Science played a significant role in the development of Russian science. However, the academic sector was fairly autonomous and poorly integrated with education and business. In 2013 all state academies were restructured into one unit, the Russian Academy of Science, which will be responsible for organising and carrying out fundamental research, as well as offering expert appraisals of research results.

In the Russian Federation universities were never major centres of research as in other countries. The government is making efforts to transform 8 federal universities and 29 national research universities into world-class universities and to change the situation (see below). As a result, the share of HEIs among R&D institutions has increased from 9 per cent to 16 per cent, and the contribution from their results to the development of the economy and society is increasing[30] (HSE, 2013a: 26, 179).

Research institutes

Almost 50 per cent of all Russian scientific organisations are research institutes (academic and industrial/sectoral). Branch institutes are usually under the jurisdiction of the federal ministries or funded by large companies. A network of research institutes is operating across Russia but is very unevenly distributed. Most of them are concentrated in just a few regions. For example, only three regions (Moscow, St. Petersburg and the Moscow region) account for more than 55 per cent of institutions.

In the1990s Russia inherited more than 4,000 research institutes (and other research organisations, including universities and departments of industrial enterprises) from the Soviet era (Cassiolato and Lastres, 2009); now there are more than

29. See: <http://goo.gl/56s52E>.
30. See: <http://goo.gl/ezpmHQ>.

3500 units with 727,000 researchers. Over 60 per cent of the GERD goes to the business sector of science (industrial research institutes, departments of industrial enterprises etc.); with 30 per cent allocated to the public sector, and 7-9 per cent to HEIs (HSE, 2013b: 131, 133). Budget expenditures in science have a somewhat different structure, with a greater emphasis on support for the public and higher education sectors of science.

Enterprises, technoparks and special economic zones

State-owned enterprises are present in a wide range of sectors, and are usually industry leaders (OECD, 2011a). They also dominate in the business segment of science. However, in general the role of enterprises (large, medium and small) is less important in Russia than in other developed countries.

More than 80 per cent of business investment in innovation in Russia is concentrated in large state-owned enterprises (OECD, 2014b). Support for business innovation focuses heavily on large businesses, including state-owned enterprises. Moreover, R&D expenditure in the business sector is largely financed by the government. Low demand for innovation from enterprises is one of the main weaknesses of the Russian NIS in general and the R&D sector in particular (OECD, 2011a).

The Skolkovo Foundation is a not-for-profit organisation whose overarching goal is to create a sustainable ecosystem of entrepreneurship and innovation, engendering a start-up culture and encouraging venture capitalism. It identified five key areas of potential growth: energy efficiency, strategic computer technologies, biomedicine, nuclear and space technologies.

There are a number of initiatives to drive the development of innovation activity in Russia, among the most important of which are territorial innovation clusters,[31] techno parks,[32] business incubators and special economic zones.[33] There are more than 50 innovation technology centres in 20 regions. Though there are no statistical data for 2013 or 2014, estimates indicate that there about 100 techoparks.[34]

31. See: <http://goo.gl/UE9xkT>. In 2013-2014, 25 clusters were chosen. They will have government support until 2017.

32. Russian university research parks, science parks or science and technology parks are the areas where innovation is key. They are physical places that support university-industry and government collaboration with the intention of creating high-technology economic development and advancing knowledge. There are 88 technoparks in the Russian Federation, but only 15 of them are considered effective and successful. See: <http:/nptachnopark.ru/upload/spravka.pdf>.

33. See: <http://eng.russez.ru>. Starting in 2005, in 2014 five zones were operating in St.Petersburg, Dubna, Zelenograd, Tomsk and Tatarstan. The main instruments of regulation here are benefits, free customs regimes, preferential leasing rules etc.

34. The Russian Union of Innovation and Technology Centres alone unites 27 innovation technology centres in 20 regions of Russia. See: <http://eng.unitc.ru>.

Regulatory and policy framework of the National Innovation System

Main recent plans/programmes

Among the most relevant strategic plans related to STI are "The basic direction of the Russian Federation's policy on science and technology development until 2020 and the subsequent period (2012)", "The strategy for innovative development of science in the Russian Federation until 2020" (Innovation Strategy 2020), "The concept of long-term socio-economic development until 2020" (CLTD) and the above-mentioned President's decrees (Kuznetsova, 2013).

The CLTD, Innovation Strategy 2020 and other key documents present several main elements of innovative development and policy framework: rational selection of S&T priorities and preferential support for competitive and flexible scientific groups (skills centres); connections between science, business and other spheres (education, health, environment etc.); more effective and optimal distribution of budget resources; and a "rationale" for partnership with foreign countries. In fact, the documents contain a "roadmap" for reforms, featuring the development of human resources for innovation, infrastructure support, stimulation of demand for innovation, performance-based budgeting, restructuring the government R&D sector, target indicators etc. (ibid.). See table 4 for target indicators for the development of the NIS.

The state programme "The Development of Science and Technology for 2013-2020" (2012) and the "Federal Targeted Programme for Research and Development in Priority Areas of Development of the Russian Scientific and Technological Complex for 2014-2020" (2013) aim to ensure by 2020 a world-class level of R&D and global competitiveness of the Russian Federation in the areas defined as the national scientific and technological priorities.[35]

The main goal of the federal targeted programme "Research and Pedagogical Cadre for Innovative Russia in 2014-2020" is to develop a system of efficient training for professional researchers and to increase their international competitiveness.

There are more than 40 special state programmes with a technological focus which aim to develop the scientific and technological fields and support modernisation processes in sectors of the national economy. For example, "The State Coordination Programme for the Development of Biotechnology in the Russian Federation until 2020" (BIO 2020) aims to bring Russia into a leading position in the development of biotechnology, including certain areas of biomedicine, agrobiotechnology, industrial biotechnology and bioenergetics and the creation of a globally competitive sector of bioeconomics, which, along with nanoindustry

35. See: <http://goo.gl/4s5Qgl>.

and ICT, should become the basis for modernisation and the creation of post-industrial economics.[36]

The use of technology platforms as a mechanism for innovation and cooperation was originally implemented in the early 2000s in Europe and adopted in Russia in 2010,[37] with 34 platforms operating in 13 fields of science and technology. All platforms carry out strategic research programmes; more than 3,000 organisations are involved in their activities.

Financial and tax mechanisms

The Russian Venture Corporation (RVC) is a government fund of funds and a development institute. It was established by the government in 2006, with the mission to encourage Russia's own venture capital industry and boost the capital of venture capital funds.[38] The Russian Venture Capital Association (RVCA) was established in 1997. It has 27 full members and 23 associate members.[39] The RVC now operates as a modern development institute and supports and integrates new government initiatives (so called national "puller" projects, national technological initiatives etc.).

The Bank for Development and Foreign Economic Affairs (Vnesheconombank) is a state corporation performing the functions of a Bank for Development. Among its goals are developing high-technology industrial sectors, unlocking the potential of innovation and the production potential of small and medium-sized enterprises.[40]

Rusnano and the Fund for Infrastructure and Educational Programmes are state instruments dedicated to fostering the growth of the nanotechnology industry in the Russian Federation. Rusnano carries out its mandate through commercial mechanisms, by co-investing in nanotechnology projects with substantial economic potential.[41]

Relevant legislation

The basic law in the field of science in the Russian Federation is the Federal Law "On Science and the State Science and Technology Policy". It was adopted in 1996, and since that time has undergone significant changes and additions. Among other important laws are those "On the Status of Science City in the Russian Federation" (1999), "On Special Economic Zones in the Russian Federation" (2005), "On Autonomous Institutions" (2006), "On the Russian Corporation for Nanotechnology" (2007), "On the Skolkovo Innovation Center" (2010)[42] and "About the Russian Academy of

36.See: <http://goo.gl/hnVcOH>.
37. See: <http://goo.gl/uWlbdq>.
38. See: <http://goo.gl/IPNxEY>.
39. See: <http://goo.gl/FvdYwu>.
40. See: <http://goo.gl/iUqZGw>.
41. See: <http://goo.gl/KFC6cX>.
42. For a comprehensive list, see: <http://goo.gl/0Cra8F>.

Science" (Kuznetsova, 2013). The fourth part of the "Civil Code of Russia" (2006) is a complete codification of the legislation on intellectual property. Some specific questions are regulated by the "Tax Code of Russia".

The practical implementation of federal laws is usually based on government regulations. Thus, these instruments regulate the integration of science, education and business; R&D organisations' performance evaluation; the functioning of public and national research centres and national research universities; the use and protection of intellectual property rights; support for young scientists; international scientific and technical cooperation; payments for increases in researchers' salaries; the development of start-ups; and other activities.

1.1.3 India

India can be considered a pioneer in the development of S&T policies, in the context of emerging countries. Even before India's independence, an alliance between elite scientists and politicians such as Jawaharlal Nehru struggled against colonial policies. What resulted was a view that considered the development of indigenous knowledge and modern S&T institutions highly important. The historical Science Policy Resolution of 1958 acknowledged the heavy price for importing S&T in the process of industrialisation. This aversion to import dependence led to import-substitution policies, which were gradually reversed from the 1990s onwards (Joseph and Abrol, 2009; Krishna, 2013).[43] Recognising the importance of innovation as an engine for growth, the Government of India has declared 2010-2020 the Decade of Innovation (Planning Commission, 2013).

The country has made significant achievements in the spheres of atomic energy, space technology, ICT software, biotechnology and pharmaceuticals. On the other hand, promotional efforts to increase the corporate sector's participation in the development of indigenous technology had seen limited success, and private-sector R&D intensity is low. There is a heavy concentration of R&D in seven industries: pharmaceuticals, transport, chemicals, electrical and electronics, defence, information technology and telecommunications. Employment in agriculture is still very high, and the share of agriculture as a proportion of GDP is also high compared to international standards. The share of manufacturing is lower than in most other late-industrialising nations at similar stages of development.

43. Public-sector enterprises were created for the production of inputs such as steel, oil and gas, petrochemicals, power, fertilisers and the equipment and machines needed for the production of capital goods. Atomic energy, space technology, clean coal, glass and ceramics, processed foods, pharmaceuticals and agro-chemicals were emphasised. The Science Policy Resolution recognised the importance of trained and educated human resources. There were S&T statements in 1958, 1986 and 2003. India's first Science and Technology Plan covered the period 1974-1979. India's policy on foreign technology and capital was relatively liberal until the mid-1960s. Then, due to balance-of-payments difficulties, the policy became more restrictive ("nationalist technological policies"). The New Industrial Policy (1991) marked a major departure from the earlier policies (Joseph and Abrol, 2009).

Main actors in the National Innovation System

Parliament

The Indian Parliament consists of the upper house (*Rajya Sabha*) and the lower house (*Lok Sabha*). It has both standing committees and ad hoc committees. Much of the discussions on STI policies are first examined by the standing committees and then ratified by the Parliament (Joseph and Abrol, 2009).

Government and intermediary agencies

The Prime Minister's Office, in consultation with the Planning Commission and other relevant ministries and departments, formulates, initiates and implements various STI policies. The Principal Scientific Advisor, the Science Advisory Council and the National Knowledge Commission have an advisory role (ibid.). The National Innovation Council was created to formulate a roadmap for innovation for 2010-2020.

The Ministry of Science and Technology[44] has three departments: Biotechnology, Science and Technology (DST) and Scientific and Industrial Research. The DST has 10 attached and subordinate offices, 5 divisions/units/wings, 3 public-sector undertakings and joint ventures and 5 statutory bodies, commissions and councils.[45]

The Council for Scientific and Industrial Research (CSIR), the Department of Atomic Energy, the Defence Research and Developmental Organisation (DRDO), the Indian Council for Agricultural Research and the Indian Council for Medical Research (ICMR) were created from 1948 to the 1960s. The Departments of Space, Electronics, Environment, Biotechnology and Ocean Development were created from the 1970s to the 1990s (ibid.).

According to the 12th Five-Year Plan, the involvement of states in R&D is low and connections with institutions such as the CSIR, ICMR and DRDO should be supported (Planning Commission, 2013).

Academia and higher education system

In 2011-12 there were 445 universities, 129 institutions deemed to be universities and 35,539 colleges, with a total of more than 20 million students.[46] In recent decades there has been a proliferation of lower-quality HEIs that operate based on student fees and service sales (Krishna, 2013). R&D in HEIs is a weak link in India's NIS (Joseph and Abrol, 2009).

44. The Ministry of Scientific Research and Cultural Affairs was originally created in 1948.
45. See: <http://dst.gov.in>.
46. See: <http://goo.gl/T0AieM>.

As mentioned above, scientists had a great influence in the policies that led to the modern Indian NIS. They still participate actively in policy discussions such as those related to the Five-Year Plans. Some of the main scientific societies are the Indian National Academy of Sciences, the Indian Science Congress Association, the National Academy of Sciences and the Indian National Academy of Engineering.

Research institutes

In 2011 there were 4533 R&D institutions in India. Half belonged to the private sector, 20 per cent to state sector, 14 per cent to the central sector, 12 per cent to universities and 4 per cent to the public sector (Department of Science & Technology, 2013). About 260 global transnational companies operate R&D laboratories in India (Joseph & Abrol, 2009).

Enterprises, technoparks and special economic zones

The private sector was responsible for 28.9 per cent of national R&D expenditure, and public-sector industries for another 5.3 per cent, in the period 2009-2010 (Department of Science & Technology, 2013).[47] Since the 2000s, business enterprises and associations such as the Federation of Indian Chambers of Commerce and Industry, the Confederation of Indian Industry and the National Association of Software and Service Companies increased their influence in discussions about STI policies (Joseph and Abrol, 2009). The gradual opening of the market allowed the upsurge of private Indian conglomerates.

India has seven special economic zones.[48] Software technology parks in Bangalore, Hyderabad, Pune, Chennai, Delhi and Gurgoan were responsible for 70 per cent of software exports in 2008 (ibid.). The India STEPs and Business Incubators' Association was founded in 2004.[49]

Regulatory and policy framework of the national innovation system

Main recent plans/programmes

Since independence the country has adopted a series of Five-Year Plans, historically inspired by the former Soviet Union model. The different approaches to indigenous versus foreign technology are reflected in the different versions of the plan.

Currently, the process of elaboration of the Five-Year Plan is very transparent. For each subject – for example, S&T – a Steering Committee is nominated, as well as several other sub-groups (for example, S&T for vulnerable members of society, mega science and global alliances, among others). Each group prepares a

47. The public sector (55.4 per cent), State sector (7.3 per cent), higher education sector (4.1 per cent).
48. See: <http://goo.gl/97Z6V9>.
49. See: <http://goo.gl/jJmbpt>.

report that is made available on the DST and Planning Commission websites.[50] For an overview of the national targets for the 12th Five-Year Plan, see table 5. The plan also establishes specific targets for different departments.

A report on technology forecasting, *India 2020 – Vision for the New Millennium*, developed by the Technology Information Forecasting and Assessment Council of the DST, had a significant impact on India's S&T policies from 2002 to 2006 (ibid.). *The S&T Policy Statement 2003* emphasised the importance of innovation. In 2013 the government announced a new Science, Technology and Innovation Policy, which deepens the focus on innovation.[51] The DST prioritises seven programme areas,[52] the Department of Biotechnology has 14 programmes,[53] and the Department of Scientific and Industrial Research has 15 programmes.[54, 55]

Financial and tax mechanisms

There are three types of financial mechanisms to finance innovations: research grants, tax incentives and venture capital. Venture capital is almost entirely provided by the private sector. Most of the research grants are awarded to either public-sector enterprises or individual researchers. Three of the main grants programmes are those from the Technology Development Board, the Techno-entrepreneurs

50. The S&T chapter is available at: <http://goo.gl/cLxCnU>.

51. The policy states the following aspirations: promoting the spread of scientific knowledge among all sections of society; enhancing skills for the application of science among young people from all social strata; making careers in science, research and innovation attractive enough for talented and bright minds; establishing world-class infrastructure for R&D to achieve global leadership in some selected frontier areas of science; positioning India among the top five global scientific powers by 2020; linking contributions of the science, research and innovation system with the inclusive economic growth agenda and combining priorities of excellence and relevance; creating an environment for enhanced private-sector participation in R&D; enabling the conversion of R&D outputs into societal and commercial applications by replicating hitherto successful models as well as establishing new public-private partnership structures; seeding S&T-based high-risk innovations through new mechanisms; fostering resource-optimised, cost-effective innovations across size and technology domains; triggering changes in the mindset and value systems to recognise, respect and reward performances which create wealth from S&T-derived knowledge; and creating a robust NIS.

52. Scientific and engineering research, technology development, S&T socio-economic development, international S&T cooperation, women scientists programme, cognitive science research initiative, technology missions: solar and water. Each of these programme areas lists a number of initiatives. See: <http://goo.gl/UXHZeD>.

53. Human resources development, international collaboration, biotech park, infrastructure facilities, R&D, the Small Business Innovation Research Initiative (SBIRI), bioinformatics, the National Biosource Board, biofuel and bioenergy, Centres of Excellence and Programme Support in Areas of Biotechnology, social development, National Jai Vigyan S&T Mission, and a patent-facilitating cell. See: <http://dbtindia.nic.in/index.asp>.

54. Building industrial R&D promotion programme, industrial R&D promotion programme, R&D by industry, scientific and industrial research organisations, public-funded research institutions, fiscal incentives, the Asia and Pacific Centre for Transfer of Technology, information technology and e-governance, common research and technology development hubs, patent acquisition and collaborative research and technology development, promotion of innovations in individuals, start-ups and SMEs, access to knowledge for technological development and dissemination, technological development and utilisation programme for women, national and international conferences and exhibitions, and industrial technology-related studies. See: <http://goo.gl/08KqsI>.

55. There are a number of other initiatives that can be mentioned: the Technology Development and Demonstration Programme was designed to adapt technology by means of research, design and development developed by industry and overseen by experts from laboratories; the Technology Absorption and Adaptation Scheme, National Register on Foreign Collaboration, S&T for Weaker Sections, S&T for Rural Development, S&T Entrepreneurship Park, and New Millennium India Technology Leadership. For a list of sector-based and overarching policies, see Joseph & Abrol (2009).

Promotion Programme and the New Millennium India Technology Leadership Initiative (Mani, 2014).

The history of the venture capital industry in India goes back to the late 1980s. India is among the top recipients in Asia of venture capital and private equity funds, but the seed funding stage is severely constricted (Planning Commission, 2013). As early as 1974, the government started to give tax benefits for R&D (Krishna, 2013).[56] For an analysis of a variety of tax incentives for domestic R&D, see Mani (2014).

Relevant legislation

The 1970 Patent Act was one of the most important initiatives by the State to foster indigenous development of technology. It abolished product patents on food, chemicals and drugs, keeping only patents for processes. It reduced the duration of patents from 14 to 5 years from the date of grant of the patent or 7 years from the date of filing, whichever was earlier. It obliged the patent owner to produce the good in India; otherwise, the patent could be repealed. It also stipulated a limit of payment of royalties of 4 per cent of the wholesale net price (Souza, 2012). In 2005, by the end of the 10-year transition period allowed by World Trade Organization rules, India amended the Patent Act and is now compliant with the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS).

1.1.4 China

China's industrialisation was characterised by the intensive use of natural resources such as coal, steel and fresh water. After 1978, technology policy was adopted to encourage foreign companies to transfer technology to local companies. The result was the creation of joint ventures between foreign and Chinese companies. Foreign Direct Investment (FDI) played an important role in China's development, but there is debate about the spill-overs for innovation (Liu and Liu, 2009). China is succeeding in creating a few domestic companies competitive in high-tech areas, including ZTE, Huawei, Xiaomi and Lenovo.

Since the 1980s, the policy has started to shift towards a major role of firms in the NIS, and demand-side policies have begun to play a greater role. Mega projects include large aircraft, next-generation internet and communications. In the last few years, there has been strong government support for the theme of innovation.

56. INR10,000 cr fund announced in the last Union Budget.

Main actors in the National Innovation System

Parliament

The National People's Congress is the highest organ of state power. Its permanent body is the Standing Committee. The National People's Congress and its Standing Committee exercise the legislative power of the State to enact and amend basic laws governing criminal offences, civil affairs, state institutions and other matters.

Government and intermediary agencies

Central and local governments have a strong influence on economic activity, controlling the land, large investment projects, infrastructure building and access to important markets such as automobiles and finance. There are severe regional disparities between regions, despite fiscal, regional, FDI and S&T policies in the 2000s (ibid.; Ping, 2013).

With regard to S&T, the main institutions are the Ministry of Science and Technology[57] and the Ministry of Education. Regarding technology policy, the Ministry of Commerce, the Ministry of Industry and Information Technology and the National Development and Reform Commission are the key actors. Other ministries with responsibility for health, defence and security, energy and transportation can also influence STI policies (Liu and Liu, 2009; Ping, 2013).

The National Science Foundation of China and the Department of Basic Research of MOST are two of the most important support agencies. Regions also have their own regional science foundation systems (Liu and Liu, 2009).

Academia and higher education system

In 2012 there were 2442 HEIs. There were also 811 institutions providing post-graduate programmes, out of which 534 were regular HEIs and 277 research institutions. In the same year there were 400,000 Chinese students studying abroad. A large proportion of these students end up employed in the high-tech sector, which gives China an important network advantage. There were 3,181

57. There are 25 affiliated agencies listed on the Ministry of Science and Technology website: Office for National Science and Technology Awards, Institute of Scientific and Technical Information of China, Center for Science and Technology Personnel Exchange and Development Service, Center of Logistics, Expert House, Changdao Training Center, China Rural Technology Development Center, Torch High Tech Industrial Development Center, China Technology Market Management and Promotion Center, Management Center for Innofund, China National Center for Biotechnology Development, High Tech Research and Development Center (Administrative Center for Basic Research), Intellectual Property Rights Center, Information Center, National Center for Remote Sensing, Supervision Service Center for Science and Technology Funds, China International Nuclear Fusion Energy Program Execution Center (ITER China), Chinese Academy of Science and Technology for Development, China Science and Technology Exchange Center (Sino-Japanese Technology Cooperation Center), Cross-Straits Science and Technology Exchange Center, Shanghai Training Center, Administrative Center for China's Agenda 21, National Science and Technology Infrastructure Center, Evaluation Center, and National Science and Technology Venture Capital Development Center.

associations or academic societies in 2012 (China Statistics Press, 2013: tables 20-44, 20-12, 20-10).

In the past, most universities were not involved in R&D, but nowadays they play a very important role in basic research. In 1998, programme 985 was created to develop nine elite universities (C9) to world-class level.[58] By the end of 2007 there were 39 universities being sponsored. One of the most interesting features of the C9 is their interconnectedness through credit recognition, exchange programmes and collaboration in post-graduate education. The productivity of these universities helps explain the rapid increase of Chinese scientific output (Battelle, 2010). For instance, researchers need to produce a certain number of publications not only for promotion but also to supervise graduate students.

Research institutes

Before 1980, government research institutes were the main institutions in the S&T system, and were given strong financial incentives to conduct applied research. They are still among the most important institutions in China's NIS. According to official statistics, in 2012 there were 3,764 government scientific R&D institutions, of which 710 subordinated to central level and 2964 subordinated to local level. They employed 343,978 full-time equivalent R&D personnel (ibid.: Table 20-43).

The Chinese Academy of Sciences (CAS) is one of the most relevant research institutions. By 2008 it had more than 50,000 regular staff. The Academic Divisions of the Chinese Academy of Sciences (CASAD) is China's highest advisory body in S&T. By the end of 2012 there were 104 research institutes, 5 universities and supporting organisations and 22 invested holding enterprises linked to the CAS.[59] The Chinese Academy of Engineering and the Chinese Academy of Social Sciences are also very relevant actors.

Enterprises, technoparks and special economic zones

Many multinational and domestic companies have R&D centres in China. In 2012 there were 47,204 industrial enterprises of the designated size developing R&D activities (13.7 per cent of the total) (ibid.: table 20-45). They employed 2,246,179 full-time equivalent R&D personnel. This represents a significant increase from 17,075 firms in 2004 (6.2 per cent of the total), which employed 542,000 full-time equivalent R&D personnel. The industrial sector accounts for more than 60 per cent of total R&D expenses (Fan, 2014).

58. Fudan University, Harbin Institute of Technology, Nanjing University, Peking University, Shanghai Jiao Tong University, Tsinghua University, University of Science and Technology, Xi'an Jiao Tong University and Zhejiang University.
59. See: <http://goo.gl/49cMd5>.

In 2012 there were 63,926 high-tech enterprises in 105 development areas (China Statistics Press, 2013: table 20-60). High-tech zones provide tax incentives and a new governance model, reduce transaction costs and promote active interaction and close cooperation among firms. Most of them are spin-offs from universities and government research institutes, new private firms and FDI enterprises. From 1999 to 2004 there were more than 2,000 spin-offs from universities each year. Lenovo is an example of a spin-off from the CAS.

Regulatory and policy framework of the National Innovation System

Main recent plans/programmes

The National High-Tech Programme ("Programme 863") was launched in 1986 to develop high technology in the areas of biology, space, information, lasers, automation, energy and new material. The Spark Programme aimed to introduce technology in rural areas, and the Torch Programme encourages entrepreneurial activity among researchers.

The National Basic Research Programme ("Programme 973") was launched in 1997. It is a national mission-oriented science programme, targeting strategic areas such as energy, information, health and materials. This programme usually involves several research institutes or universities.

The Knowledge Innovation Programme was launched in 1998, allowing the CAS to reorganise itself in the face of the growing role of the universities. The main goal is to make the CAS a leading international basic research institution, by enabling it to attract key scientists. The One Hundred Talents Programme aims to attract talented Chinese scientists back to China. It has helped the CAS attract more than 400 scientists (Liu and Liu, 2009). There are several other similar programmes, some of them from local governments: the 1,000 Talents Programme, the 1,000 Young Talents Programme, Programme 321, Programme 530 and the Peacock Programme (Fan, 2014).

The Outline of a National Medium- and Long-Term Plan for the Development of Science and Technology (2006-2020) was issued at the National Science and Technology Conference held in 2006 and aims to strengthen indigenous innovation, especially in domestic companies (Ping, 2013). Several related policies stressed the importance of improving the intellectual property rights system and the establishment of international standards (ibid.).

Several programmes have been created to support S&T talents: the 11th Five-Year Plan on the Post-Doctoral System, the National Outline for a Medium- and Long-Term Talent Development Plan (2010-2020),[60] the Yangtze River

60. See: <http://cfd.seu.edu.cn/s/583/t/2172/73/24/info95012.htm>.

Scholar Programme, the Truth Award, the Special Research Fund for University Doctorate-Awarding Units, the Fund for Overseas Chinese Scholars, Guidelines on Implementation of an Incentive Distribution System for Indigenous Innovation in Enterprises, and Interim Procedures for Strengthening Innovative Talent Training in the Implementation of Major Projects (Ping, 2013).

There are policies to improve credit conditions for small and medium enterprises, such as the Notification on Strengthening the Construction of the Credit Guarantee System for Small and Medium-Sized Enterprises and Implementing Regulations of Financial Policies to Support National Key Science and Technology Programmes.

Public procurement policies give priority to indigenous innovative products. Foreign companies that are willing to transfer technology to local companies will receive priority listing over other candidates (Liu and Liu, 2009).

Financial and tax mechanisms

The National Science Foundation of China is mainly funded by government resources. There are many types of support, ranging from teams to talented scientists, from general to key projects. It operates on a peer review basis (ibid.). Subsidies for R&D laboratories are provided for 512 selected large companies. Among these, 200 large firms were selected for support under the National Medium-and Long-Term Strategic Plan.

Chinese tax incentives for R&D started in 1996, and are significant compared to international standards (Araújo, 2013).

Relevant legislation

The relevant regulation includes the Patent Law,[61] Technology Contract Law, Science and Technology Progress Law, Agricultural Popularisation Law, Decision on Strengthening Technology Innovation, Developing High Technology and Realising Industrialisation, Provisions on Promoting the Commercialisation of Scientific and Technological Achievements, Implementation and Regulations for the Science and Technology Progress Award, Regulations for the Natural Sciences Award, and the Science and Technology Progress Law, among others (Ping, 2013).

1.1.5 South Africa

South Africa leads in sub-Saharan Africa in terms of its economy and innovation capabilities. It has a long history of establishing and creating the institutions and actors of the NIS. Scientific organisations (such as astronomy, and a geological

61. Patents in China are registered under three categories: invention, utility model and design.

survey) go as far back into the colonial period as the 18th century, and universities were established in the late 19th century. There are pockets of intensive interaction and participation in global innovation networks, and a large demand for high skills which the education and training system struggles to meet.

The country has experienced deep changes since the end of apartheid. In the 1990s its S&T policies were redesigned in accordance with the NIS concept, but there are problems in implementing these policies effectively. Challenges relate to its context of high levels of inequality and poverty alongside rapid economic growth and wealth in some sectors; the strength of the higher education system and its role in scientific research; and a lack of maturity of government systems (Kruss and Lorentzen, 2009). The manufacturing sector's share of GDP is decreasing. On the other hand, some service sectors – such as banking and finance – are well developed and operate at the global level.

South Africa faces several key issues that prevent it from growing into an important actor in the global innovation arena. The human capital needed for a sustainable innovation system is lacking. Although there are good universities, there is a need to improve the quality of primary and secondary schooling, particularly in science and mathematics, to grow the pool of candidates available for higher education and S&T careers. One of the key challenges for the near future is the low capacity to train university professors and researchers. PhD programmes have been targeted as a priority, but, given the small pipeline, the output remains low. The current staff are ageing and not being adequately replaced (Dube and Ngulube, 2013).

Main actors in the National Innovation System

Parliament

The South African Parliament consists of the upper house (National Council of Provinces) and the lower house (National Assembly). The main committees that deal with innovation are the Portfolio Committees on Higher Education and Training, on Science and Technology and on Trade and Industry and the Select Committee on Economics and Business Development. Important innovation-related committees also include the Portfolio Committees on Energy, on Agriculture, Forestry and Fisheries and on Economic Development.

Government and intermediary agencies

The Department of Science and Technology (DST) provides the guidelines for and coordinates the NIS. The Departments of Education, Trade and Industry, Minerals and Energy, Environmental Affairs and Tourism, Agriculture, Water Affairs and Forestry, and Health also participate in the NIS. The Council on Higher Education and the National Advisory Council on Innovation are key advisory bodies (Kruss and Lorentzen, 2009) .The National Research Foundation is an intermediary agency

that manages and promotes the country's research capabilities. It is responsible for grants, partnerships, benchmarking and funding and managing national research facilities. The South African Agency for Science and Technology Advancement is a business unit of the National Research Foundation which aims to increase the public understanding of S&T.

The Technology Innovation Agency was created based on the recommendations of an OECD review of the NIS in 2007. As a national coordinating agency, it aims to bridge the gap between research institutions and the market, enabling and supporting technological innovation in key sectors of the economy. It incorporated a number of DST initiatives such as a technology stations programme based in the universities of technology, and technology incubators in key fields such as biotechnology. However, it has not yet operated successfully, and a review committee was established to determine how it may function more effectively in future.

Higher education system

The education and training system is rooted in the legacy of the apartheid system and colonialist traditions, with a majority of universities being founded in the early 20th century. A major movement to reform the education system in 2004 led to mergers to create larger and more relevant types of university: research universities, comprehensive universities, and universities of technology (OECD, 2007).

South Africa has 23 public HEIs. The Department of Higher Education and Training manages the policies aimed at the creation of the human capital and knowledge needed for the NIS. However, it still has to tackle brain drain[62] issues and the ageing of academic staff, who are not being replaced in sufficient numbers for sustainable academic growth in the near future[63] (Docquier and Rapoport, 2012).

The National Student Financial Aid Scheme[64] is a government programme that grants student loans and bursaries for students who cannot afford the fees – most in undergraduate studies but some graduate students also. It is a major instrument for redress and to extend access. The National Research Foundation provides bursaries and scholarships to students in S&T.

Research institutes

The Council for Scientific and Industrial Research (CSIR) is the main public research institute sponsored by the government. It was constituted in 1945 and develops multidisciplinary research, technological innovations and industrial and scientific

62. Emigration of potential scientists, researchers and academic staff.
63. These concerns were addressed in the 2008 National Research and Development Strategy, but they are still a problem that needs to be solved.
64. See: <http://goo.gl/e40zAM>.

development. The Human Sciences Research Council (HSRC) is responsible for social science research, including data creation and statistical analysis of the inputs and outputs of the NIS. It is responsible for the South African Innovation Survey and the R&D Survey, on behalf of the DST.[65]

There are a number of other mission-oriented science councils that report to line departments but are coordinated by the DST. The Medical Research Council was established in 1969 to conduct research, development and technology transfer to promote the improvement of health and the quality of life of the population. The Agricultural Research Council, MINTEK (minerals and mining) and the Council for GeoScience are some of the main bodies performing research. Others fund research in specific fields, such as the Water Research Commission. There have been significant policy attempts to enhance the performance of these actors, through a system of national reviews and performance monitoring.

The National Research Foundation hosts a number of centres of excellence and National Research Facilities: HartRAO (astronomy), iThemba LABS (nuclear), NZG (zoology), SAAO (environment), SAIAB (ichthyology).[66] Four regional biotechnology innovation centres were created and are now under the ambit of the Technology Innovation Agency: BioPAD (Pretoria), Life Lab (Durban), Cape BioTech Trust (Cape Town) and PlantBio.

Enterprises

"South Africa has a nucleus of strong, innovation-performing business enterprises, and this base appears to be broadening" (OECD, 2007: 10). The results of the Innovation Survey of 2008 indicate that 10.3 per cent of South African enterprises made process innovations, 8.9 per cent developed product innovations, and 7.9 per cent did both (HSRC and DST, 2011). By 2007 the business sector funded a high 45 per cent of R&D. There is a need for comprehensive support to innovation in small and medium enterprises (SMEs) (OECD, 2007). "Spatial divides and limited opportunities for entrepreneurship during apartheid have left a legacy that continues to hinder employment and SME development" (International Monetary Fund, 2013: 7). One initiative that aims to develop biotechnology enterprises is the eGoLiBio life sciences incubator,[67] also now coordinated under the Technology Innovation Agency.

The Technology and Human Resources for Industry Programme has been successful in the development of high-level technical skills for industry, in collaboration with higher education and public research institutes.[68]

65. The 2008 South African Innovation Survey is available at: <http://goo.gl/LXLoIm>.
66. See: <http://goo.gl/ZqO31s>.
67. See: <http://goo.gl/n6s1sP />.
68. See: <http://goo.gl/du6nj0>.

The South African Nuclear Energy Corporation SOC Limited (NECSA) is responsible for the development of South Africa's nuclear energy capabilities.[69] A promising nuclear energy innovation project, the Pebble Bed Modular Reactor, had its activities effectively shut down following a lack of commercial interest and finance.

A major success has been achieved in astronomy and space science, identified as a key challenge in the Ten-Year Innovation Plan. South Africa has won the bid to co-host the Square Kilometre Array (SKA), a massive global radio astronomy project that will encourage innovation and research. Local scientists are already involved in a set of global innovation networks.

Regulatory and policy framework of the National Innovation System

Main recent plans/programmes

The White Paper on Science & Technology: Preparing for the 21st Century recognised, as early as 1996, the need to embed S&T strategies in a larger drive to achieve an NIS and also to create a system of output measures for S&T institutions (Department of Arts, Culture, Science and Technology, 1996). It lacked a deep understanding of the research capacities of the time, aiming for goals that could not realistically be met within the system's growth capacity (Cassiolato and Vitorino, 2009). Other programmes related to harnessing STI for economic and social development include a National Research and Development Strategy (2002), a National Biotechnology Strategy (2002), Accelerated and Shared Growth Initiative for South Africa (2006) and a National Industrial Policy Framework (2006).[70]

In 2007 the DST drafted a ten-year plan for the NIS, aiming to transform South Africa into a knowledge-based economy. It recognises the huge gap between South Africa and knowledge-driven economies and the inadequate production of knowledge workers. It recommends the need to improve access to finance, create an innovation-friendly regulatory environment and strengthen the NIS. It establishes five key challenge areas: "farmer to pharma" value chain to strengthen bio-economy, space science and technology, energy security, global climate change, and human and social dynamics.

The National Development Plan was launched in 2011.[71] It aims to increase the quality of life of all South Africans and reduce inequalities. The plan is divided into five-year planning cycles. Poverty reduction and the creation of opportunities are considered enablers to innovation capacity. The plan promotes these goals by

69. South Africa's SAFARI-1 reactor has a global capacity in supplying medical radioisotopes, mainly molybdenum-99, with a production capacity up to 25 per cent of the global demand. (Source: World Nuclear Association).

70. For more details on these policies, see Kruss and Lorentzen (2009).

71. See: <http://www.gov.za/documents/detail.php?cid=348761>.

aiming to reduce barriers to employment, elevating the standards of education, especially in regards to mathematics and science education and promoting the creation and improvement of critical infrastructure. It recommends a focus on R&D in areas of competitive advantage, such as: high-value agriculture, mining inputs and downstream processing, environment and energy, and financial services.

Financial and tax mechanisms

The National Research Foundation is the main funding agency, although bodies such as the Medical Research Council and the Water Research Commission also fund R&D. Innovation funding is coordinated through the Technology Innovation Agency and the DST.

There are several incentive schemes for business and enterprises to promote investment and innovation: the Enterprise Investment Programme, Black Business Supplier Development Programme, Critical Infrastructure Programme, Business Process Outsourcing and Offshoring, Sector-Specific Assistance Scheme, Co-operative Incentive Scheme, Technological Human Resources for Industry Programme and the Support Programme for Industrial Innovation (Kahn, Melo and Matos, 2014).

Recently the government issued a tax incentive for organisations to incentivise R&D activities. It consists of a 150 per cent tax deduction for R&D costs.[72]

Venture capital agencies have been a major gap in the NIS, but investments are increasing. A 2013 survey on venture capital in South Africa listed 102 funds as participants out of 126 potential participants.[73]

Relevant legislation

Patent legislation in South Africa has been lacking in comparison to other BRICS countries. Its system does not account for search procedures in patent applications, and also allows for weak patent registration. For example, concerns remain over the difficulty of producing and marketing generic medicines because of slow procedures at the Medicine Control Council and the lack of use of easing mechanisms provided under international treaties.[74]

In 2013 the Department of Trade and Industry released the Draft National Policy on Intellectual Property of South Africa, proposing reforms and interventions in the system. In it the Department acknowledged the weakness of the system of

72. See: <http://goo.gl/VYSxJp>.

73. The annual Venture Capital and Private Equity Industry Performance Survey of South Africa is available at: <http://goo.gl/P68n3G>.

74. Mainly the TRIPS agreement that provides compulsory licensing and limits to the number of protected years to health-related patents.

health-related patents and the need for change. The National Intellectual Property Management Organisation has been established and monitors new legislation regarding the commercialisation of publicly funded research, which also requires all HEIs to establish technology transfer units.

1.2 Successful international experiences of cooperation and knowledge sharing

1.2.1 The European Union's Seventh Framework Programme for Research

The Seventh Framework Programme for Research and Technological Development (FP7) was the European Union's (EU) main instrument for funding research in Europe and ran from 2007 to 2013. The specific programme on cooperation supported all types of research activities carried out by different research bodies in trans-national cooperation and aimed to gain or consolidate leadership in key scientific and technological areas. The Russian Federation, India and China had significant cooperation within the FP7 framework.

The BILAT-RUS-Advance project aims to facilitate STI cooperation between Russia and the EU. It will support bilateral STI dialogue between the Russian Federation and EU Member States, Candidate Countries and Associate Countries. This will also imply support to coordinate EU Member States' and Associated Countries' research policies and programmes with regard to Russia. The programme will further promote bilateral cooperation to the best scientists and organisations by increasing awareness on FP7 cooperation opportunities.[75]

India in FP7: More than 140 Indian research organisations have been selected for funding in over 90 projects. For a complete list, see the Euro India Research Centre website.[76]

Dragon-STAR supports Sino-European collaboration on four levels: enhancing the quality of Chinese participation in framework programmes; supporting the reciprocity originating from the signed EU-China Scientific Cooperation Agreement; supporting bilateral cooperation in the broader field of innovation and especially technological cooperation between industrial players; and supporting the ongoing bilateral scientific cooperation dialogue.

The Impact of Networks, Globalisation, and their Interaction with EU Strategies (INGINEUS) addresses the impact of globalisation and the rapid growth of selected emerging economies in the world on competitiveness strategies of EU firms, industries and regions. It is coordinated by Fondazione Eni Enrico Mattei and brings together researchers from 14 institutions located in Europe, Brazil, China, India and South Africa.

75. See: <http://goo.gl/GoeJr9>.
76. See: <http://goo.gl/pzibNG>.

1.2.2 Brazilian agricultural cooperation with other countries

Embrapa's virtual laboratories programme (Labex) is a mechanism to foster international cooperation among developing and developed countries and promote agricultural research networks. Senior researchers are chosen by competitive selection to promote scientific exchange with other scientists from overseas laboratories, for a period of two to three years. Selected researchers participate in teams and collaborate on projects of mutual interest, which can enable the creation of networks of international scientific research. There are Labex projects in Europe, the USA, South Korea and China. Labex China was established in the Chinese Academy of Agricultural Sciences[77] (OECD, 2014a).

Project Cotton-4 aimed to transfer Brazilian technology to increase profitability of the cotton supply chain in Benin, Burkina Faso, Chad and Mali. This project, developed by the Brazilian Cooperation Agency (ABC) and Embrapa, was in the spotlight during the World Trade Organization's 14th Consultation Mechanism Meeting of the General Director.[78]

The Agricultural Innovation Market Place[79] aims to benefit smallholder producers by enabling innovation through collaborative partnerships between Africa, Latin America and Brazil. Eight African projects were selected in 2011, and 12 in 2013.[80]

1.2.3 Cross-country projects among BRICS countries

China Brazil Earth Resources Satellite: In addition to Labex China, Brazil and China also cooperate on space technology. In 1988 a partnership involving INPE and the Chinese Academy of Space Technology was signed to develop remote-sensing satellites. This partnership continues to date.

The Chinese-Russian University: Moscow State University and Peking Polytechnic University signed an agreement to establish a Chinese-Russian University in Shenzen. It will begin to operate in 2015.[81]

1.2.4 Multilateral university cooperations

The University of Shanghai Cooperation Organisation is a network university which combines the educational potential of several universities from Kazakhstan, China, Kyrgyzstan, the Russian Federation and Tajikistan. The education model is based

77. See: <http://goo.gl/kWlvaA>.
78. See: <http://goo.gl/FYE6mb>.
79. See: <http://goo.gl/YGmEM3>.
80. See: <http://goo.gl/oj5H0y>.
81. See: <http://goo.gl/vcmiwD>.

on academic exchange, where each student from a joint cooperation programme must spend at least one semester in a partner university in another country.[82]

1.3 Concluding remarks

Facts and figures presented in this section can be well depicted in the metaphor of the glass half empty or half full. BRICS countries improved their performance in STI indicators (glass half full), but still lag far behind more developed countries (glass half empty).

The Russian Federation inherited a significant scientific legacy from the Soviet era. The Soviets were not only the first ones to send humans into space but were also responsible for the world's first nuclear power station, built in 1954 (Gokhberg et al., 2009). China has accomplished a large number of technological achievements that have been described throughout this chapter, Brazil has the third largest aircraft manufacturing industry, South Africa plays a leading role in astronomy with its SKA project, and India made history with its recent Mars Orbiter Mission. All these successes were possible due to highly skilled professionals in their respective areas.

When one analyses the leading STI performance of China among the BRICS countries, it is important to consider the structure of the economies. On the one hand, R&D is an input for innovation. On the other hand, "high levels of R&D intensity are the outcome of industry, economic, and social structures" (Sheehan and Wyckoff, 2003: 9). Brazil, Russia and South Africa are resource-rich countries, and services account for a relatively high share of India's economy. China, in turn, is the main manufacturing country in the world, and benefited in recent decades from productivity increases. These factors help explain larger increases in productivity and the share of GERD as a percentage of GDP. These considerations are important for countries such as Brazil and South Africa, where manufacturing industry's share of GDP is decreasing.

Increased innovation might be an objective for policymakers involved in STI policies, but, for firms, innovation is a way to solve problems and/or increase competitiveness. For example, when oil lies some 6,000 metres below sea level, there is no other way than to develop all the technologies necessary to extract it safely from that depth. When a firm participates in competitive markets such as consumer electronics, it has to constantly introduce innovative products to the market. China has been more successful than other BRICS countries in creating companies that compete in high-tech competitive sectors, including overseas markets.

82. See: <http://goo.gl/Pso7ZJ>.

China has a use-driven science policy. University-industry interactions are characterised by a heavy reliance on scientific research by universities and research institutes. On the other hand, industry plays an important role in supporting universities with funds, equipment and demands. Patents derived from university-industry collaborations are increasing (Liu, Lv and Gao, n.d.).

If the accomplishments have been significant, the challenges are also huge. While the Russian Federation has a well-educated population, and Chinese students from certain eastern cities are excelling in PISA exams, Brazil, India and South Africa have very unequal education systems, with a relatively small highly educated elite and a large low-skilled population. There are also large regional disparities in all BRICS countries. Table 6 lists the distinguishing features, key achievements and main challenges (further discussed in Section 3) of BRICS countries' NISs.

TABLE 6
Distinguishing features, key achievements and main challenges of BRICS countries' National Innovation Systems

	Brazil	Russia	India	China	South Africa
Distinguishing features	• Late development of universities and industrialisation • Rich in natural resources • Several promising domestic firms were acquired by foreign enterprises during the opening of the economy in the early 1990s	• Deep social, political and economic changes in the 1990s • High-income country • Rich in natural resources • Significant scientific legacy from Soviet era • Importance of government-funded R&D institutions in the NIS	• Rapid economic growth in recent decades • Recognition of the importance of the service sector, non-technological and 'bottom-of- the-pyramid' innovations • Importance of planning (e.g. Five-Year Plans) • Return of students and STI workers from abroad	• High share of manufacturing sector in GDP • Rapid economic growth in recent decades • Importance of government research institutions in the NIS • Importance of planning (e.g. Five-Year Plans) • Strong drive to develop indigenous technologies • Return of students and STI workers from abroad	• Deep social, political and economic changes in the 1990s • Rich in natural resources • Recognition of the importance of 'grass-roots' 'bottom-of-the-pyramid', 'inclusive' innovations, and the notion of 'innovation for inclusive development' • In the 1990s, South Africa's S&T policies were redesigned in accordance with the NIS concept, but there are problems in implementing these policies effectively
Key achievements	• Aeronautical, biofuel and deep sea oil drilling technologies • Increasing agriculture productivity • Increasing number of scientific publications	• Nano, space, nuclear and defence technologies • Highly educated population	• Space, nuclear and pharmaceutical technologies • ICT services exports • Increasing number of patents and scientific publications	• Nano, material sciences, space and ICT technologies • Increasing exports of high-tech products • Recent emergence of national champions in high-tech areas • Increasing number of patents and scientific publications • Increasing R&D spending as a share of GDP • Outstanding performance of students from certain eastern cities in PISA exam	• Astronomy, space and geology sciences • Service sectors such as banking and finance operate at the global level • Increasing number of scientific publications

(Continues)

(Continued)

	Brazil	Russia	India	China	South Africa
Main challenges for the NIS	• Low levels of productivity compared to developed countries • Low and stagnant level of patent applications • Overall low impact of patents and publications • Regional imbalances within the country • Imbalances in education and qualification of the workforce • Dependence on commodities and resource-based industries • Overall weak innovation performance and demand for innovation from business sector, compared to developed countries	• Low levels of productivity compared to developed countries • Overall low impact of patents and publications • Regional imbalances within the country • Dependence on commodities and resource-based industries • Overall weak innovation performance and demand for innovation from business sector, compared to developed countries	• Low levels of productivity compared to developed countries • Overall low impact of patents and publications • Regional imbalances within the country • Imbalances in education and qualification of the workforce • Overall weak innovation performance	• Low levels of productivity compared to developed countries • Overall low impact of patents and publications • Environmental imbalances within the country • Regional imbalances • Prevalence of 'secondary innovations'	• Low levels of productivity compared to developed countries • Overall low impact of patents and publications • Regional imbalances within the country • Imbalances in education and qualification of the workforce • Dependence on commodities and resource-based industries • Overall weak innovation performance and demand for innovation from business sector, compared to developed countries

Source: Prepared by authors.
Note: Not an exhaustive list.

2 COMMON CHALLENGES

This section presents some of the main common challenges that BRICS countries face in their efforts to develop their NISs.

2.1 Improve performance in science, technology and innovation

First of all, governance issues have to be addressed. BRICS countries have large populations and territories, complex government structures and different levels of government. This, of course, makes coordination of STI policies very difficult. It is also hard to coordinate STI policies with other public policies.

One aspect that needs to be emphasised is the lack of integration of innovation-related policies. As presented in Section 2, BRICS countries have complex innovation systems, involving multiple institutions, laws, regional levels, policies and programmes. It is a complex task to integrate and coordinate all these dimensions, but it is essential that this integration happens; otherwise, a lot of time and human and financial resources may be wasted.

As mentioned in the Introduction, BRICS countries have achieved – to different degrees – impressive improvements in their STI indicators. However, when one analyses the quality or impact of publications and patents, improvements have not been so great. As presented before, the percentage of Triadic patents filed by BRICS countries is still low. Most of the increase from 2001 to 2011 is due to China and India.

2.2 Education

Russia has a well-educated population, and Chinese students from some eastern cities of the country outperform most of other countries' students in PISA exams. However, considering populations as a whole, there is room for improvement in all BRICS countries, even though the situation is much more serious in Brazil, India and South Africa. Brazilian students perform poorly in PISA exams, and Brazil does not have an elite as large as China's to compensate for this overall low quality of education. In South Africa, the number of students per teacher is unbalanced,[83] and the tuition system does not allow students in the poorest areas to grow academically because of the financial cost (Leibowitz and Bozalek, 2014). Inequality issues play a major role in the lack of human resources needed for sustainable innovation systems. The poorest citizens are denied access to high-quality education and are trapped in a low-income situation leading to a cycle of low educational attainment and low quality of life (Maharaj, Lastres and Scerri, 2013). The INGINEUS project the showed poor education indicators of BRICS countries compared to their European counterparts (Muller and Manamela, n.d.). Without a well-educated population, it is hard to imagine how a country can have spectacular performance in STI.

The rapid increase in the number of higher education students, shown in Figure 3, came at the expense of quality, especially in private institutions. This is a concern also for China and the Russian Federation, where support to selected top universities may increase inequality in the higher education system. The rapid expansion has also led to a decline in the average qualification of education professionals (ibid.). There are a number of other studies dealing with this subject in BRICS countries (Loyalka et al., 2012; Kruss et al., 2012; Guimarães, 2013).

An important aspect to be considered is ageing of the population. With the exception of the Russian Federation, BRICS countries are facing rapid demographic changes, and, by 2050, only India and South Africa will have relatively young populations. This represents an opportunity, as well as a challenge, for these two countries. The concept of lifelong training needs to be more widespread among BRICS countries, as the skills needed by the market are changing rapidly, and, as mentioned before, large proportions of the populations of BRICS countries did not have access to proper education at the appropriate age.

2.3 Equity

The OECD *Review of Innovation Policy: Russian Federation 2011* states "There is a sharp contrast between progressive territorial, scientific, technological and industrial nodes of excellence and a rather large stagnant pool of firms and organizations with

83. There were 30 students per teacher in 2012 (Source: World Bank, <http://goo.gl/qlxpLb>).

very low productivity and little innovation" (OECD, 2011b: 12). This is also true for other BRICS countries. Even FDI helps increase the concentration of resources. In China 60 per cent of foreign R&D laboratories are located in Beijing, 18 per cent in Shanghai, and 6 per cent in Shenzhen (Fan, 2014). STI policies such as those described throughout this report tend to emphasise high technology ("high technology myopia"), the research institutes and firms with more capabilities. These policies have a sound rationale, as they aim to enable national STI actors to compete at the forefront of technology.

But there are three drawbacks to these kinds of policies. The first is the regional aspect. Inequalities among regions of each BRICS country might be even greater than those observed between BRICS and Triadic nations. The report mentioned successful special economic zones initiatives, which helped less developed regions, but more needs to be done in this respect.

Second, there are also structural heterogeneities within and between sectors. Large firms tend to be much more productive than smaller ones. As they usually benefit more than smaller ones from STI policies, this gap tends to increase. A similar phenomenon occurs with regard to manufacturing versus services. Most of the policies focus on industrial firms, which are more productive, while there is a clear tendency of a growing share of value added coming from the low-productivity service sector. The Inter-American Development Bank (2010) emphasises the importance of increasing the productivity of firms at the bottom of the pyramid.

The third aspect, related to the previous two, is the fact that large portions of BRICS populations cannot afford higher-end products. In this regard, it is worth mentioning the concepts of "base-of-the-pyramid markets"[84] and "frugal innovation", illustrated in India's 12th Five-Year Plan (Planning Commission, 2013: 279): "The core idea is to innovate to produce affordable and qualitative solutions that address the needs of people at the Bottom of the Pyramid, eliminate disparity and focus on an inclusive growth model." Similar concepts of "grass-roots innovation", "inclusive innovation", "innovation for inclusive development",[85] with an emphasis on fostering interaction between universities, science councils and marginalised communities, have been the object of policies in South Africa (Kruss, 2014).

2.4 Developing indigenous innovations, and the middle-income trap

Overall, the level of innovation activity by enterprises is low compared to developed countries. There is a dilemma of how to enter a globalised market while capturing a significant share of the value added.

84. See: <http://goo.gl/5vBZiB>.
85. See: <http://goo.gl/l6CFsb>.

FDI plays an important role in the development of countries such as Brazil and China. In China, multinational corporations are responsible for nearly 90 per cent of high-tech exports (OECD, 2008).[86] But their relevance in the technological development of the countries that receive investments is controversial. There is strong evidence that they invest more in their home countries than abroad (see Table 7). In the case of laboratories in developing countries, there is also evidence that multinational corporations do not perform much research, but a lot of development activities (Cassiolato et al., 2014a). Multinational corporations in China "have performed little technological innovation or product design in the country. Core technologies mostly remain controlled by the foreign partners in joint ventures or by company headquarters abroad" (OECD, 2008, p. 35). It is important no note that there are national, sectoral and company specificities to this phenomenon (Gastrow and Kruss, 2012).

Studies show that companies that develop the R&D capture most of the added value, while those that only assembly the goods capture a small fraction (Linden, Kraemer and Dedrick, 2009).

Two experiences might illustrate how long-term vision and the existence of absorptive capabilities are crucial to the development of indigenous innovations. In the 1950s Brazil was only beginning its industrialisation process. Against all the odds a Brazilian officer[87] and his team championed the creation of the Technological Institute of Aeronautics at the Aerospace Science and Technology Department. The inspiration came from the Massachusetts Institute of Technology (MIT), and several foreign professors contributed in the early years of the institution. In the 1960s, once again against the odds, another Brazilian officer[88] and his team championed the creation of Embraer, which developed its first aircraft under the lead of a French engineer,[89] with a team of Brazilian and overseas engineers formed by the Technological Institute of Aeronautics. Challenges such as "green aircraft" are a reminder that the need to innovate is never ending.

Sponsors of the SKA project in South Africa soon perceived that a geographical advantage alone was not sufficient for success. Efforts to coordinate actors on the skills demand side and the skills supply side were developed. The innovation system for the astronomy sector include universities, science facilities, research institutes, large engineering firms, local and international intermediaries and national policy support. The SKA project involves a dense, globally connected innovation network.

86. See: OECD, 2008.
87. Casimiro Montenegro.
88. Osires Silva.
89. Max Holste.

This report discusses the contribution of technological catch-up and qualified manpower to increasing productivity and competitiveness. However, improving living standards to levels approaching those of developed nations involves other variables that are beyond the scope of the report.

3 RECOMMENDATIONS

- BRICS countries should facilitate visas for researchers, by making special arrangements to facilitate and encourage exchanges among BRICS researchers, including simplifying visa approval procedures and reducing approval times.
- BRICS should strengthen cooperation under the Patent Cooperation Treaty to facilitate the simultaneous registration of patents in all BRICS countries.
- BRICS should establish a fund to finance patent applications.
- BRICS should support joint projects carried out by researchers and institutions from all BRICS countries. It should create a BRICS framework programme similar to the EU FP7 to finance joint projects with funding allocated from the New Development Bank. Additionally, partnerships should be established among funds supporting research projects in each of the BRICS countries to finance joint projects carried out by researchers and institutions from all BRICS countries.
- BRICS should facilitate technology and knowledge transfer. This includes by establishing a fund for technology transfer which will act as a depository where owners of the rights to technologies will be able to apply for assistance in their commercialisation. Projects may be financed by the fund or jointly with private companies and development institutions from BRICS countries.
- BRICS should establish a BRICS institute of innovation and technology, along the lines of that successfully developed in the European context.[90]
- BRICS should increase its focus on innovation for inclusive development. Science and technology in BRICS countries should be harnessed to the benefit of poor and marginalised populations, and not only focus on the forefront of technology and catch-up.
- There has been a number of capital market failures in early-stage funding of innovation-driven start-ups in BRICS countries; therefore, BRICS should develop research on the comparative assessment of financing

90. For information about the EU experience. See: <http://eit.europa.eu/>.

options, comprising comparisons across several national programmes that have been in operation,[91] as well as the experiments with state-supported venture funding for commercialisation and enterprise creation.[92]

- BRICS countries should sponsor comparative initiatives to enhance linkages between universities and industry. The separation of teaching and research in BRICS countries has adversely affected innovation. They can learn from each other to improve linkages. Experiments with various instruments to promote university-industry linkages and public-private partnerships have been developed, such as incubation centres for university spin-offs.[93]
- BRICS countries should consider the possibility of adopting a Bayh-Dole Act equivalent in all BRICS nations, covering the ownership of intellectual property rights of state-funded research by institutions or researchers.
- BRICS countries should sponsor research focused on public-private partnership funds and efforts to re-invigorate research in universities.
- BRICS countries should stimulate the sharing of experiences of technology licensing offices in universities and R&D institutions and comparative research on investments and other policies for higher education to build human resources for innovation.[94]
- Given that the TRIPS agreement has affected all BRICS nations, as intellectual property rights laws were changed in all of them, BRICS countries should stimulate comparative research into regulatory experimentation in intellectual property laws,[95] on compulsory licensing conditions,[96] on the possibilities of collaboration/learning in identifying TRIPS-compatible mechanisms to enhance innovations, and on access to new technologies, without having a significant adverse impact on incentives to invent and innovate.
- BRICS countries should provide incentives to stimulate the participation of their firms in global production in innovation/technology networks.
- BRICS countries should cooperate to design a joint position for their participation in TRIPS-related negotiations.

91. For example, China: 863; Brazil: FINEP; India: DST; Russia: Do Good Law (2005) and SMEs Law (2006).
92. For example, SIDBI has been quite useful in India, as has more recently the INFUSE public-private partnership fund for clean energy in India.
93. For example, the DST in India, the Innovation Law (2006) in Russia and learnings from China, where this seems to be quite successful.
94. For example, special schemes to attract non-residents, and sharing experiences on the impact of such policies.
95. For example, in patentable subject matter (Article 3 (d) in India emphasises higher efficacy for patentability.
96. Chinese law emphasises capability, reasonable effort and time criteria. Similar changes in Brazil?

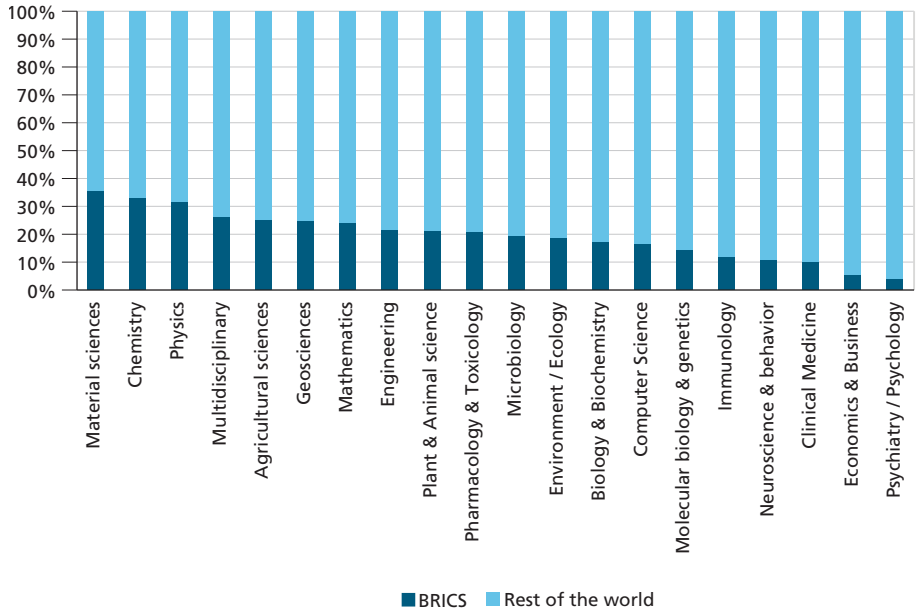
ANNEX A

TABLE A.1
Selected indicators of tapping global knowledge and of domestic generation of knowledge for the BRICS

	Brazil	China	India	Russia	South Africa
Payments for the use of intellectual property (USD millions)					
2005	1405	5321	961	1533	1017
2012	3666	17749	2820	7629	2017
Students at tertiary level studying abroad					
2000	17,481	140,642	55,875	28,034	5,391
2005	19,631	402,941	139,566	38,948	5,473
2010	27,926	567,574	202,778	49,769	6,321
R&D personnel					
2000	73,909	691,518	114,656	504,852	14,032[1]
2005	109,510	1,115,384	153,075	462,338	17,088
2010	129,269	1,149,161	NA	438,695	19,177[2]
Expenditure on R&D (USD billion, PPP)					
2000	656.5	1081.9	356.0	272.7	87.0[1]
2005	856.9	2989.9	650.0	815.9	222.5
2010	2486.8	10431.7	938.3[3]	1766.8	248.1[4]
Scientific and technical journal articles					
2000	6,407	18,479	10,276	17,180	2,221
2005	9,897	41,604	14,635	14,425	2,395
2009	12,306	74,019	19,917	14,016	2,864

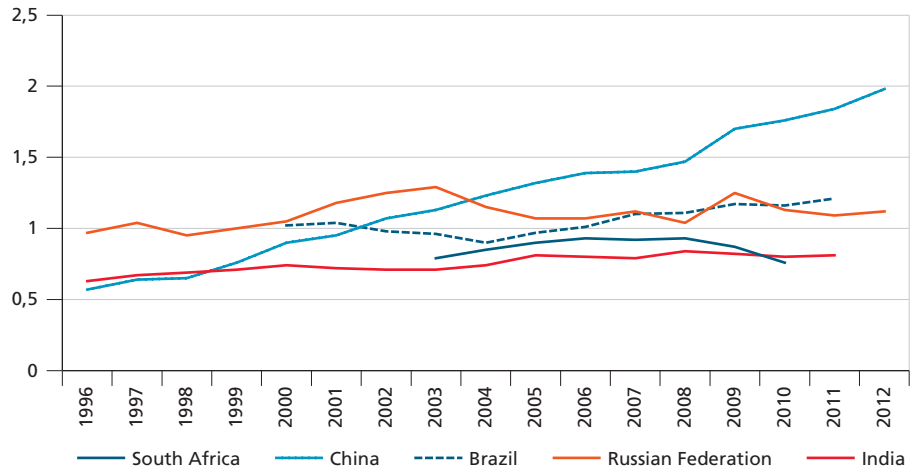
Source: OECD (2014c: 79).
Notes: [1] Figures from 2001.
[2] Figure from 2008.
[3] Figure from 2007.
[4] Figure from 2000.

FIGURE A.1
Share of total number of articles published in 20 major areas between 2008 and 2011 – BRICS countries and the rest of the world
(In %)



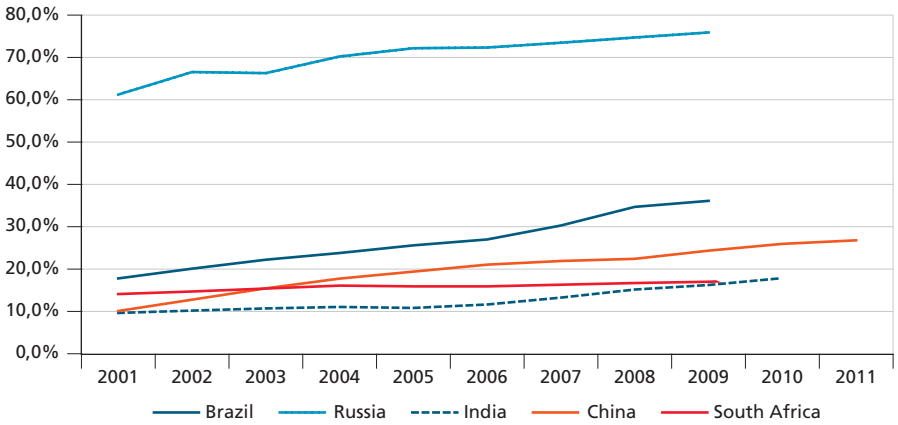
Source: Nascimento (2014), based on Thompson Reuters data.

FIGURE A. 2
Gross domestic expenditure on R&D as a percentage of GDP (1996-2012)



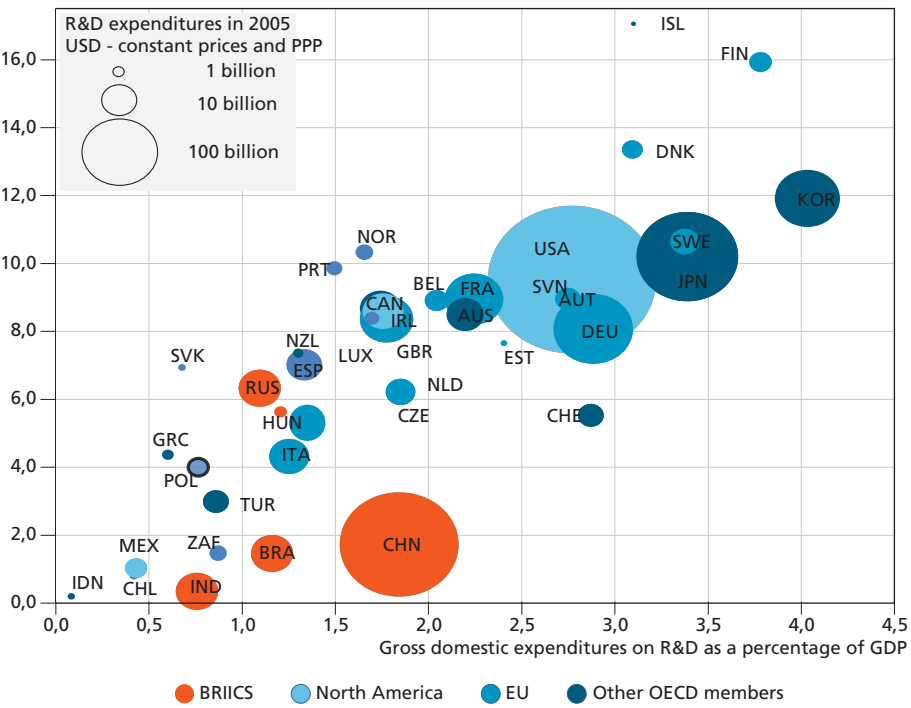
Source: prepared by authors based on UNESCO Institute for Statistics data.

FIGURE A. 3
Gross enrolment ratios on tertiary education – Brazil, Russia, India, China and South Africa (2001-2011)



Source: Nascimento (2014), based on Thompson Reuters data.

FIGURE A. 4
R&D in OECD and key partner countries (2011)
Researchers, per thousand employment



Source: OECD (2013: 50).

TABLE A.2
Key indicators for BRICS

	Brazil	China	India	Russia	South Africa
GDP (current USD in billions)					
1990	462	357	327	517	112
2012	2523	8227	1859	2015	384
GDP per capita PPP (constant 2011 international $)					
1990	9,997	1,490	1,812	19,286	9,902
2012	14,301	10,771	5,050	23,184	11,989
Real GDP growth (% CAGR)					
1990-2000	2.6	10.4	5.6	-3.9	1.8
2000-2012	3.3	10.1	7.2	4.7	3.4
Total factor productivity: total economy (% of US level)					
2000	19.3	10.5	7.4	8.4	NA
2008	16.7	18.6	9.0	11.4	NA
Total factor productivity: manufacturing (% of US level)					
2000	20.1	15.6	6.5	10.7	NA
2008	13.4	21.5	7.8	8.8	NA
Total factor productivity: services (% of US level)					
2000	20.3	10.4	8.9	8.1	NA
2008	18.2	20.1	10.8	11.9	NA

Source: OECD (2014c: 281).

TABLE A.3
Contributions to exports by technological intensity of products (In %)

		1990	1995	2000	2005
Brazil	High Tech	5.0	4.0	13.0	8.0
	Low Tech	18.0	17.0	14.0	12.0
	Medium Tech	24.0	26.0	24.0	27.0
	Primary products	26.0	23.0	21.0	24.0
	Resource-based	27.0	31.0	28.0	29.0
China	High Tech	-	14.0	24.0	35.0
	Low Tech	-	47.0	42.0	32.0
	Medium Tech	-	18.0	18.0	20.0
	Primary products	-	10.0	7.0	4.0
	Resource-based	-	11.0	9.0	8.0

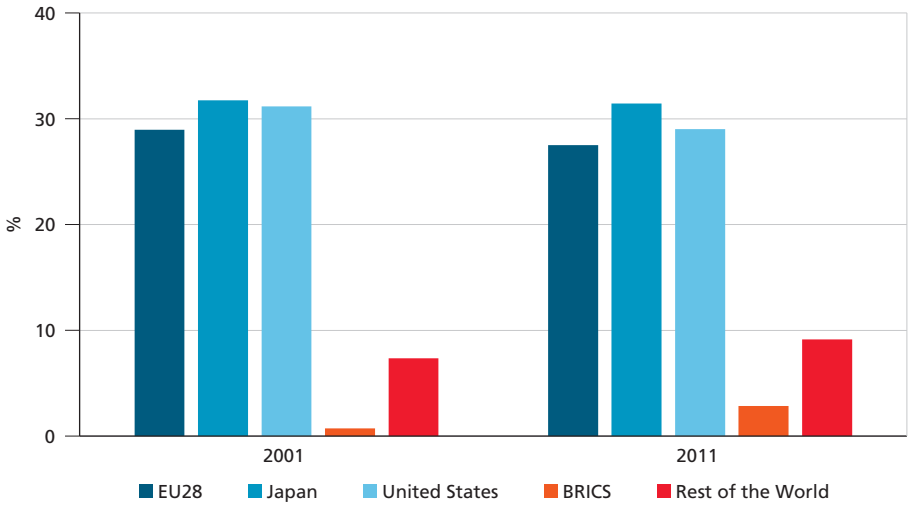
(Continues)

(Continued)

		1990	1995	2000	2005
India	High Tech	3.0	3.0	3.0	3.0
	Low Tech	37.0	37.0	40.0	33.0
	Medium Tech	10.0	11.0	10.0	13.0
	Primary products	22.0	21.0	15.0	12.0
	Resource-based	29.0	28.0	31.0	38.0
Russian Federation	High Tech	-	-	4.0	2.0
	Low Tech	-	-	10.0	7.0
	Medium Tech	-	-	13.0	11.0
	Primary products	-	-	47.0	52.0
	Resource-based	-	-	26.0	29.0
South Africa	High Tech	-	3.0	5.0	5.0
	Low Tech	-	16.0	15.0	12.0
	Medium Tech	-	23.0	28.0	30.0
	Primary products	-	15.0	14.0	25.0
	Resource-based	-	43.0	37.0	28.0

Source: OECD (2014c: 284), based on UN Comtrade (2013), United Nations Commodity Trade Statistics Database. Available at: <http://comtrade.un.org/db/default.aspx>.

FIGURE A.5
Triadic patent families by blocs (2001 and 2011)



Source: OECD (2013: 67).

TABLE A.4
Key concept of a long-term development of the Russian Federation up to 2020 – target indicators for NIS development

%	2007	2020
GERD to GDP ratio	1.1	2.7
Labour productivity growth rates	6-7	9-0
Share of high-tech sectors in value added	11	17-19
Share of high-tech products exports in the world's total	0.3	2.0
Share of innovative products in total sales	6	25-35
Share of industrial enterprises engaged in technological innovation	13	40-50
Value added of innovation sector to GDP	10-11	17-20

Source: Kuznetsova (2013, p. 84).

TABLE A.5
National targets for India's science and technology sector for the 12th Five-Year Plan

Global share of publications	> 5%
Global ranking in SCI publications	better than 6th
Global ranking in number of patent cooperation treaties	better than 10th
FTEs in R&D personnel	250,000
PhDs outputs in whole science sector	12,500 per year
Public–private sharing of investments	50:50
Gender parity in EMR funding (PI ratios)	better than 60:40
Relative global rank in patent portfolio	better than 9th
Commercialisation of patents	better than 5% levels
Share of high-technology content in exports	better than 20%
Global ranking in innovation index	better than 25th
Establishment of Section 25 companies	in select sectors

Source: Planning Commission (2013: 274).

TABLE A.6
Share in R&D expenditure performed by US transnational corporation subsidiaries, 2000-2007 (%)

Region/Period	2000	2001	2002	2003	2004	2005	2006	2007
Total	100	100	100	100	100	100	100	100
EU-15, Canada and Japan	80.3	77.2	79.6	79.9	75.8	75.3	73.4	73.8
Asia and Pacific[1]	9.6	12.2	9.2	8.9	9.7	9.0	11.1	11.2
Latin America	3.2	2.9	3.7	3.1	2.8	3.0	3.5	3.3
Africa	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Brazil	1.2	1.0	1.5	1.5	1.4	1.5	1.9	1.8
Russian Federation	0.0	-	0.0	0.0	0.1	0.1	0.3	0.3
India	-	-	0.4	0.4	0.4	1.2	1.1	1.3
China	2.5	-	3.1	2.5	2.2	2.4	2.6	3.3
South Africa	0.1	0.1	-	0.1	0.1	0.1	0.2	0.2

Source: Cassiolato et al. (2014a: 24), based on Bureau of Economic Analysis data.
Note: [1]Excluding Japan and Australia.

REFERENCES

ADATO, M.; HODDINOTT, J. Social protection: opportunities for Africa. **Policy Briefs**, Washington, v. 1, n. 5, 2008.

ARAÚJO, B. C. **Políticas de inovação no Brasil e na China no século XXI**. Brasília: Ipea, 2013.

ARROIO, A.; SCERRI, M. **The promise of small and medium enterprises**. New Delhi: Routledge, 2014.

BANK OF INDIA. **Priority sector credit and rural development, financial inclusion**. Mumbai: Bank of India. Available at: <http://goo.gl/cwk2og>. Accessed on: 10 Oct. 2014.

BATTELLE. **2011 global R&D funding forecast**. Columbus: Advantage Business Media, 2010.

BELLISH, J. **The economic cost of Somali Piracy**. Colorado: Oceans beyond Piracy, 2012. Available at: <http://goo.gl/LMJOEN>. Accessed on: 8 Apr. 2015.

BIS – BANK FOR INTERNATIONAL SETTLEMENTS. **Basel III**: the liquidity coverage ratio and liquidity risk monitoring tools. Basel: BIS, 2013a. Available at: <http://goo.gl/qDFj3O>. Accessed on: 10 Mar. 2015.

_____. **Foreign exchange turnover in April 2013**: preliminary global results. New York: BIS, 2013b. (Triennial Central Bank Survey). Available at: <http://goo.gl/eMO5Ez>. Accessed on: 7 Apr. 2015.

_____. **Annual Report**: 2013-14. Basel: BIS, 2014.

BRASIL. Ministério da Educação. **Plano Nacional de Educação**. Brasília: MEC, 2014.

BRAZIL. Ministry of Education. **The plan for the development of education**: reasons, principles and programs. Brasília: MEC, 2007. Available at: <http://goo.gl/Q1Fvdt>. Accessed on: 12 Mar. 2015.

BRADLEY, T. Brazil now consumes 18% of the world's cocaine. **Quartz**, 23 Sept. 2012. Available at: <http://goo.gl/spRcHR>. Accessed on: 9 Apr. 2015.

BRICS. Action Plan 2012-2016 for Agricultural Cooperation of BRICS Countries. **BRICS website**, 2010. Available at: <http://goo.gl/cFL602>. Accessed on: 11 Mar. 2015.

_____. **Sanya Declaration** – BRICS Leaders Meeting, Sanya, Hainan, China. Apr. 2011. Available at: <http://goo.gl/vz7hjA >. Accessed on: 11 Mar. 2015.

_____. 3rd Health ministers meeting, South Africa 7th November 2013, Cape Town Communique. **BRICS website**, 2013a. Available at: <http://goo.gl/rz91k5>. Accessed on: 11 Mar. 2015.

_____. **BRICS** – Minister tsenoli opens the 2nd BRICS Urbanisation Forum and 3rd friendship cities and local government cooperation forum. Durban: BRICS website, 2013b. Available at: <http://goo.gl/5rcwsh>. Accessed on: 12 Mar. 2015.

_____. **The 2nd BRICS Urbanisation Forum**. The Durban Declaration. Durban: BRICS, 2013c. Available at: <http://goo.gl/sA9IOW>. Accessed on: 11 Mar. 2015.

_____. **First BRICS science, technology and innovation ministerial meeting, Cape Town declaration**. Cape Town: BRICS, 2014. Available at: <http://goo.gl/7FmzSz>. Accessed on: 11 Mar. 2015.

_____. **Sixth BRICS Summit** – Fortaleza Declaration. Fortaleza: BRICS, 2014. Available at: <http://goo.gl/tH5dnJ>. Accessed on: 8 Apr. 2015.

BRICS TRADE UNION FORUM. **Fortaleza Declaration, III BRICS Trade Union Forum**. Fortaleza: BRICS, 2014. Available at: <http://goo.gl/0MWml0>. Accessed on: 11 Mar. 2015.

CASSIOLATO, J. E. *et al*. FDI and national systems of innovation: lessons from the experience of BRICS. *In*: _____. **Transnational corporations and local innovation**. New Delhi: Routledge, 2014a.

_____. **Transnational corporations and local innovation**. New Delhi: Routledge. 2014b.

CASSIOLATO, J. E.; LASTRES, H. M. M. Science, technology and innovation policies in the BRICS countries: an introduction. *In*: CASSIOLATO, J. E.; VITORINO, V. **BRICS and development alternatives**: innovation systems and policies. London; New York: Anthem Press, 2009.

CASSIOLATO, J. E.; VITORINO, V. **BRICS and development alternatives**: innovation systems and policies. London; New York: Anthem Press, 2009.

CHINA. Ministry of Education of the People's. **Outline of China's National Plan for Medium and long-term education reform and development (2010-2020)**. Beijing: Ministry of Education of the People's, 2010.

_____. **Statistical communiqué on implementation of the national education funding in 2011**. Beijing: Ministry of Education of the People's Republic of China, 2012.

_____. **Response progress report**. New Delhi: Ministry of Rural Development, 2012. Available at: <http://goo.gl/IkhWNN>. Accessed on: 10 Oct. 2014.

_____. **China education development statistics bulletin 2013**. Beijing: Ministry of Education of the People's Republic of China, 2013.

CHINA DAILY. BRICS advocate cooperative approach, peaceful solution to hot issues. **China Daily**, Beijing, 16 July 2014. Available at: <http://goo.gl/oqyWNV>. Accessed on: 7 Apr. 2015.

CHU, S. K. **Achieving EFA and Beyond**: education for all in China 2000-2010. Beijing: Unicef; Unesco; National Commission of the People's Republic of China for Unesco; 2013.

CONVENTION ON BIOLOGICAL DIVERSITY. Climate change and biodiversity. **CBD website**, 2015a. Available at: <http://goo.gl/QLUw8m>. Accessed on: 11 Mar. 2015.

_____. Aichi biodiversity targets. **CBD website**, 2015b. Available at: <http://goo.gl/p062bF>. Accessed on: 11 Mar. 2015.

DASCT – DEPARTMENT OF ARTS, CULTURE, SCIENCE AND TECHNOLOGY. **White paper on science and technology**: preparing for the 21st century. Pretoria: DASCT, 1996.

DEMIDOV, O. ICT in the BRICS Agenda before the 2015 Summit: installing the missing pillar? **Security Index**, v. 20, n. 2 (107), p. 127, 2014.

DENG, L.; SHEN, Q.; WANG. L. **Housing policy and finance in China***:* a literature review. Washington: Department of Housing and Urban Development, 2009.

DE NEGRI, J. A.; KUBOTA, L. C. **Políticas de incentivo à inovação tecnológica no Brasil**. Brasília: Ipea, 2008.

DEPARTMENT OF HEALTH. **National health insurance in South Africa**. Pretoria: Department of Health of the Republic of South Africa, 2011.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING. **White paper for post-school education and training**. Building an expanded, effective and integrated post-school system. Pretoria: Department of Higher Education and Training, 2013.

DEPARTMENT OF HUMAN SETTLEMENTS. **Celebrating 20 years of human settlements**: bringing the freedom charter to life. Pretoria: Department of Human Settlements, 2014. Available at: <http://goo.gl/7K0nQx>. Accessed on: 10 Oct. 2014.

DEPARTMENT OF SOCIAL DEVELOPMENT – SOUTH AFRICA. **Framework for Brazil, Russia, India, China, and South Africa (BRICS) cooperation on population matters**. Pretoria: Department of Social Development. Available at: <http://goo.gl/STb8yi>. Accessed on: 10 Oct. 2014.

DIRCO. Third meeting of the BRICS Ministers of Agriculture and Agrarian Development, Pretoria, South Africa. **DIRCO website**, 2013. Available at: <http://goo.gl/Xb1j8Y>. Accessed on: 11 Mar. 2015.

DOBBS, R. *et al*. **Infrastructure productivity**: how to save $1 trillion a year. New York: McKinsey.

DOCQUIER, F.; RAPOPORT, H. Globalization, brain drain, and development. **Journal of Economic Literature**, v. 50, n. 3, p. 681-730, 2012.

DOLAN, M. Scoping the new subprime as watchdogs cry 'bubble', **Reuters Canada**, 9 July 2014. Available at: <http://goo.gl/UZyDZ2>. Accessed on: 10 Mar. 2015.

DST – DEPARTMENT OF SCIENCE & TECHNOLOGY. **Research and development statistics at a glance 2011-12**. New Delhi: DST, 2013.

DUBE, L.; NGULUBE, P. Pathways for retaining human capital in academic departments of a South African university. **SA Journal of Information Management**, v. 15, n. 2, 2013. Available at: <http://goo.gl/ILm9sS>.

FAN, P. Innovation in China. **Journal of Economic Surveys**, v. 28, n. 4, p. 725-745, 2014. Available at: <http://goo.gl/FiucHT>.

FEDERAL DRUG CONTROL SERVICE OF THE RUSSIAN FEDERATION. **Digest as of 29 February 2012**. Moscow: FDCS, 2012. Available at: <http://goo.gl/cmRTXD>. Accessed on: 9 Apr. 2015.

FSB – FINANCIAL STABILITY BOARD. **Policy measures to address systemically important financial institutions**. Basel: FSB, 2011. Available at: <http://goo.gl/wtVIJE>. Accessed: 10 Mar. 2015.

GASTROW, M.; KRUSS, G. Skills and the formation of global innovation networks: a balancing act. **Innovation and Development**, v. 2, n. 2, p. 263-283, 2012.

GLEWWE, P.; A. L. KASSOUF. The Impact of the Bolsa Escola/Familia Conditional Cash Transfer Program on Enrollment, Dropout Rates and Grade Promotion in Brazil. **Journal of Development Economics**, v. 97, n. 2, p. 505-517, 2012. Available at: < http://goo.gl/r5ZdhW>. Accessed on: 11 Mar. 2015.

GLOBAL INSTITUTE, 2013. Available at: <http://goo.gl/4MtaZh>. Accessed on: 10 Mar. 2015.

GOKHBERG, L. *et al*. Prospective agenda for science and technology and innovation policies in Russia. *In*: CASSIOLATO, J. E.; VITORINO, V**. BRICS and development alternatives**: innovation systems and policies. London; New York: Anthem Press, 2009.

GOKHBERG, L.; KUZNETSOVA, T. S&T and innovation in Russia: key challenges of the post-crisis period. **Journal of East-West Business**, v. 17, n. 2-3, p. 73-89, 2011.

GOLDMAN SACHS. **Dreaming with BRICs**: the path to 2050. New York: Goldman Sachs, 2003. (Global Economics Paper, n. 99). Available at: <http://goo.gl/M7dqGa>. Accessed on: 7 Apr. 2015.

GOVERNMENT OF INDIA MINISTRY OF HOUSING AND URBAN POVERTY ALLEVIATION. **National Urban Housing and Habitat Policy**. New Delhi: Ministry of Housing and Urban Poverty Alleviation, 2007.

GROUP OF 77 AND CHINA. **Position paper of the group of 77 and China on the reform of the international and financial economic system**: voice and participation of developing countries in the Bretton woods institutions. New York: Group of 77 and China, 2010. Available at: <http://goo.gl/zb7JVo>. Accessed on: 10 Mar. 2015.

GUIMARÃES, R. R. M. The future of higher education in BRIC countries: a demographic perspective. **Revista Brasileira de Estudos Populacionais**, v. 30, n. 2, p. 549-566, 2013.

HEILIG, G. K. **World urbanization prospects**: the 2011 revision. New York: United Nations Department of Economic and Social Affairs, Population Division, 2012.

HESA. **HESA strategic framework for the next 10 years**: pathways to a diverse and effective South African higher education system. Pretoria: Higher Education of South Africa, 2009. Available at: <http://goo.gl/6H608l>. Accessed on: 11 Mar. 2015.

HSE – HIGH SCHOOL OF ECONIMICS. **Science and technology indicators in the russian federation**: data book. Moscow: National Research University – Higher School of Economics, 2013a. Available at: <http://goo.gl/qQSPD6>. Accessed on: 12 Jan. 2015.

_____. **Indicators of education in the Russian Federation**: data book. Moscow: National Research University – Higher School of Economics, 2013b. Available at: <http://goo.gl/D5TxWO>. Accessed on: 12 Jan. 2015.

HSRC – HUMAN SCIENCES RESEARCH COUNCIL; DST – DEPARTMENT OF SCIENCE AND TECHNOLOGY. **South African innovation survey**: main results 2008. Pretoria, 2011.

IDB – INTER-AMERICAN DEVELOPMENT BANK. **The age of productivity**. New York: Palgrave Macmillan, 2010.

IMF – INTERNATIONAL MONETARY FUND. **Currency amounts in new special drawing rights (SDR) basket**. Washington: IMF, 2010a. Available at: <http://goo.gl/QeIBl6>. Accessed on: 10 Mar. 2015.

_____. G-20 ministers agree "historic" reforms in IMF governance. **IMF website**, 2010b. Available at: <http://goo.gl/zTjOZv>. Accessed on: 10 Mar. 2015.

_____. **South Africa**: 2013 article IV consultation (IMF Country Report, n. 13/303). Washington: IMF, 2013.

_____. **World Economic Outlook**: 2011. Washington: IMF, 2011.

_____. **World Economic Outlook**: 2014. Washington: IMF, 2014. Available at: <http://goo.gl/GjaVSu>. Accessed on: 7 Apr. 2015.

INDIAN. Ministry of Human Resource Development. **Annual Report**: 2012-2013. New Delhi: Ministry of Human Resource Development, 2013.

INSTITUTE FOR ECONOMICS AND PEACE. **Global Terrorism Index***:* capturing the impact of terrorism for the last decade. Sydney: IEP, 2012. Available at: <http://goo.gl/M1Ln7g>. Accessed on: 9 Apr. 2015.

INTERNATIONAL ENERGY AGENCY. CO_2 emissions statistics. **International Energy Agency website**, 2015. Available at: < http://goo.gl/ZOBtOQ>. Accessed on: 11 Mar. 2015.

INTERNATIONAL LABOUR ORGANIZATION. **Global employment trends 2014**. Geneva: International Labour Organization, 2014. Available at: <http://goo.gl/hK4aoK>. Accessed on: 15 Oct. 2014.

INTERNATIONAL SOCIAL SECURITY ASSOCIATION. Social security coverage extension in the BRICS A comparative study on the extension of coverage in Brazil, the Russian Federation, India, China and South Africa. **International Social Security Association website**, 2013. Available at: <http://goo.gl/Wr2C6P>. Accessed on: 10 Apr. 2015.

_____. Social security programs, throughout the world. **International Social Security Association website**, 2014. Available at: <http://goo.gl/1xPdHU>. Accessed on: 14 Oct. 2014.

IPC-IG. Youth and employment among the BRICS. **Poverty in Focus**, Brasília, n. 28, 2014. Available at: <http://goo.gl/lMjZXa>. Accessed 14 October 2014.

JOSEPH, K. J.; ABROL, D. Science, technology and innovation policies in India: achievements and limits. *In*: CASSIOLATO, J. E.; VITORINO, V. **BRICS and development alternatives:** innovation systems and policies. London; New York: Anthem Press, 2009.

JUST NET COALITION. Statement to the BRICS Summit in Fortaleza, Brazil. **Just Net Coalition**, July 2014. Available at: <http://goo.gl/y8fwt3>. Accessed on: 9 Apr. 2015.

JUWEI, Z. Social protection in China: Current Status and Challenges. *In*: M. G. ASHER; OUM, S.; PARULIAN, F. (Eds.). **Social Protection in East Asia** – Current State and Challenges. Jakarta: ERIA, 2010. p. 371-398. Available at: <http://goo.gl/7470ba>. Accessed on: 12 Mar. 2015.

KAHN, M.; MELO, L. M.; MATOS, M. G. P. **Financing innovation**. New Delhi: Routledge, 2014.

KASEKE, E. Social security and older people. **International Social Work**, v. 48, n. 1, p. 33-48, 2005.

KEET, D. Perspectives and proposals on the BRICS for and from popular Civil Society Organisations. **Economic Justice Network**, Nov. 2013.

KLOCHIKHIN, E. A. Russia's innovation policy: stubborn path-dependencies and new approaches. **Research Policy**, v. 41, p. 1620-1630, 2014.

KOELLER, P.; GORDON, J. L. Brazil. *In*: SCERRI, M.; LASTRES, H. M .M. **The Role of the State**. New Delhi: Routledge, 2013.

KRISHNA, V. V. India. *In*: SCERRI, M.; LASTRES, H. M. M. **The Role of the State**. New Delhi: Routledge, 2013.

KRUSS, G. *et al*. **Academic interaction with social partners**: investigating the contribution of universities to economic and social development. Cape Town: HSRC Press, 2012.

KRUSS, G. **Linking knowledge producers and marginalised communities**. Pretoria: HSRC, 2014. Available at: <http://goo.gl/jEO1eU>. Accessed: 13 Mar. 2015.

KRUSS, G.; LORENTZEN, J. The South African innovation policies: potential and constraint. *In*: CASSIOLATO, J. E.; VITORINO, V. **BRICS and development alternatives**: innovation systems and policies. London; New York: Anthem Press, 2009.

KUMAR, M. IFC launches $2.5 billion rupee-denominated bonds for infra projects in India. **Reuters website**, 20 Aug. 2014. Available at: <http://goo.gl/PjgW4p>. Accessed on: 10 Mar. 2015.

KUMAR, N.; BARUA, A. **Global Economic Outlook, Q4 2013**: the impact of fed tapering on emerging economies – struggling with the ebb. New York: Deloitte University Press, 2013. Available at: <http://goo.gl/UVWzs0>. Accessed on: 10 Mar. 2015.

KUZNETSOVA, T. Russia. *In*: SCERRI, M.; LASTRES, H. M .M. **The Role of the State**. New Delhi: Routledge, 2013.

LEIBOWITZ, B.; BOZALEK, V. Access to higher education in South Africa. **Widening Participation and Lifelong Learning**, v. 16, n. 1, p. 91-109, 2014.

LINDEN, G.; KRAEMER, K. L.; DEDRICK, J. Who captures value in a global innovation network? The case of Apple's iPod. **Communications of the ACM**, v. 52, n. 3, p. 140-144, 2009.

LIU, X.; LIU, J. Science and technology and innovation policy in China. *In*: CASSIOLATO, J. E.; VITORINO, V. **BRICS and development alternatives**: innovation systems and policies. London; New York: Anthem Press, 2009.

LIU, X.; LV, P.; GAO, W. **Synthesis paper on HRD policies and MNC subisidiaries** – foreign direct investment in China. INGINEUS Project, 2011.

LOYALKA, P. *et al*. **Getting the quality right**: engineering education in the BRIC countries. Stanford: Stanford University, 2013.

MAHARAJ, R.; LASTRES, H. M. M.; SCERRI, M. **Inequality and development challenges**. London: Routledge, 2013.

MALLET, V. India restricts outward investment to bolster rupee. **Financial Times**, 15 Aug. 2013. Available at: <http://goo.gl/ujHkxa>. Accessed on: 10 Mar. 2015.

MASTERS, B. Basel III will "damage developing countries". **Financial Times**, 14 June 2012. Available at: <http://goo.gl/Mmgnx3>. Accessed on: 10 Mar. 2015.

MANI, S. India. *In*: KAHN, M.; MELO, L. M.; MATOS, M. G. P. **Financing innovation**. New Delhi: Routledge, 2014.

MCGRANAHAN, G.; G. MARTINE. **Urbanization and development**: policy lessons from the BRICS experience. London: IIED, 2012. Available at: <http://pubs.iied.org/10622IIED.html>. Accessed on: 12 Mar. 2015.

MCKEE, M. *et al*. 'BRICS' role in global health and the promotion of universal health coverage: the debate continues. **Bulletin of the World Health Organization**, v. 92, n. 6, p. 452-453. 2014.

MDB WORKING GROUP ON INFRASTRUCTURE. **Infrastructure action plan**. MDB Working Group on Infrastructure, 2011. Available at: <http://goo.gl/3OD6Jb>. Accessed on: 10 Mar. 2015.

MELLO, F. **The BRICS and social participation from perspectives of civil society**. Brasília: Instituto de Estudos Socioeconômicos (INESC)/Rede Brasileira pela Integração dos Povos (REBRIP), 2013.

MULLER, L.; MANAMELA, A. **Synthesis paper on HRD policies and MNC subsidiaries**. INGINEUS Project, 2011.

NASCIMENTO, P. S. Some trends in higher education and research in BRICS countries. *In*: FIKENI, S. *et al*. **BRICS and Africa**: partnership for development, integration and industrialization – Papers of the fifth BRICS Academic Forum. Pretoria: DIRCO, 2014.

NBSC – NATIONAL BUREAU OF STATISTICS OF CHINA. **China Statistical Yearbook**. Beijing: China Statistics Press, 2013. Available at: <http://goo.gl/xUstrl>. Accessed on: 13 Mar. 2015.

NIKOLAEV, D.; D. CHUGUNOV. **The education system in the Russian Federation**. Education Brief 2012. Washington: World Bank, 2012.

OBSTFELD, M. **The SDR as an international reserve asset**: what future? London: IGC, 2011. Available at: <http://goo.gl/xQ1ffY>. Accessed: 10 Mar. 2015.

OECD – THE ORGANIZATION FOR ECONIMIC CO-OPERATION AND DEVELOPMENT. **OECD reviews of innovation policy**: South Africa. Paris: OECD Publishing, 2007.

_____. **OECD reviews of innovation policy**: China 2008. Paris: OECD Publishing, 2008.

_____. **Economic Policy reforms 2010**: going for growth. Paris: OECD, 2010. Available at: <http://dx.doi.org/10.1787/888932535489>. Accessed on: 10 Oct. 2014.

_____. **OECD reviews of innovation policy**: Russian Federation 2011. Paris: OECD, 2011a.

_____. **OECD reviews of innovation policy**: Russian Federation 2011. Paris: OECD Publishing, 2011b.

_____. **OECD science, technology and industry scoreboard 2013**. Paris: OECD Publishing, 2013.

_____. **Innovation for Agriculture Productivity and Sustainability**: review of brazilian policies. Paris: OECD Publishing, 2014a.

_____. **OECD Economic Surveys**: Russian Federation 2013. Paris: OECD Publishing, 2014b.

_____. **Perspectives on global development 2014**: boosting productivity to meet the middle-income challenge. Paris: OECD Publishing, 2014c.

O'NEILL, J. BRICS and beyond. **GoldmanSachs website**, 2007. Available at: <http://goo.gl/havJmp>. Accessed on: 12 Mar. 2015.

ORLOV, V. **Global Internet Governance as a new common agenda for the BRICS states***:* proposals for shaping BRICS agenda for 2014-2015. *In*: BRICS ACADEMIC FORUM. Rio de Janeiro: PIR Center, 16-19 Mar. 2014. Available at: <http://goo.gl/Koht8v>. Accessed on: 8 Apr. 2015.

OXFORD UNIVERSITY PRESS. **The BRICS Report**: a study of Brazil, Russia, India, China and South Africa with special focus on synergies and complementarity. New Delhi: Oxford University Press, 2012.

PAPAIOANNOU, E.; PORTES, R. Costs and benefits of running an international currency. **European Economy**, n. 348, 2008. Available at: <http://goo.gl/e6RYHx>.

PARTNERS IN POPULATION AND DEVELOPMENT. **BRICS commitment for cooperation on population matters**. 2014. Available at: <http://goo.gl/p3m8lq>. Accessed on: 10 Oct. 2014.

PEET, R. **Unholy trinity**: The IMF, World Bank and WTO. London: Zed Books, 2003.

PEOPLE'S REPUBLIC OF CHINA. **China's position paper on the development agenda beyond 2015**. Beijing: Ministry of Foreign Affairs, 2013. Available at: <http://goo.gl/gYpxgs>. Accessed on: 29 Aug. 2014.

PING, L. China. *In*: SCERRI, M.; LASTRES, H. M. M. **The Role of the State**. New Delhi: Routledge, 2013.

PLANNING COMMISSION; GOVERNMENT OF INDIA. **Twelfth Five-Year Plan (2012-2017)**: faster, more inclusive sustainable growth. New Delhi: Sage Publications India, 2013.

PLANNING COMMISSION. **Twelfth Five-Year Plan (2012-2017)**. New Delhi: Sage Publications, 2013.

POST GLOBALIZATION INITIATIVE. **Declaration of the G20 Counter-Summit**. Saint Petersburg: 4 Sept. 2013. Available at: <http://goo.gl/XhG1Ez>. Accessed on: 11 Mar. 2015.

QI, X. The Rise of BASIC in UN climate change negotiations. **South African Journal of International Affairs**, p. 295-318, Dec. 2011.

RAJAN, R. **A step in the dark**: unconventional monetary policy after the crisis. Basel: BIS, 2013. Available at: <http://goo.gl/iRR6BL>. Accessed on: 10 Mar. 2015.

REISEN, H. **BRICS economy and social affairs**. Gütersloh: Bertelsmann-Stiftung, 2013. (Sustainable Governance Indicators). Available at: <http://goo.gl/67jAuG>. Accessed on: 7 Apr. 2015.

ROBINSON, M.; MICHAELS, D. SEC said to seek standard and poor's suspension of CMBS rating. **Bloomberg Business**, 8 Dec. 2014. Available at: <http://goo.gl/uqEKWs>. Accessed on: 10 Mar. 2015.

RUSSIA DIRECT. **From brain drain to Brain Gain**. Russia: Direct Quarterly Report, 14 May 2014. Available at: <http://goo.gl/dgdpFq>. Accessed on: 11 Mar. 2015.

RUSSIAN FEDERATION. **National project "Education"**. Moscow: Russian Federation, 2005.

_____. **National project "Health"**. Moscow: Russian Federation, 2006.

_____. **Energy strategy to 2020**. Moscow: Russian Federation, 2009.

_____. Housing for Russian Families programme. **Dostupnoe-zhile**, 2013. Available at: <http://www.dostupnoe-zhile.ru/>. Accessed on: 11 Mar. 2015.

SARA, S. Drug use in South Africa has increased by 600 per cent in the last decade. **The World Today**, 19 June 2013.

SCERRI, M.; LASTRES, H. M. M. **The Role of the State**. New Delhi: Routledge, 2013.

SHEEHAN, J.; WYCKOFF, A. **Targeting R&D**: economic and policy implications of increasing R&D spending (STI Working Papers, n. 2003/8). Paris: OECD, 2003.

SHISANA, O. *et al*. The SANHANES-1 TEAM. **South African national health and nutrition examination survey (SANHANES-1)**. Cape Town: HSRC Press, 2014.

SHOTTER, J. China and Switzerland sign bilateral currency swap line. **Financial Times**, 21 July 2014. Available at: <http://goo.gl/43M9Ld>. Accessed on: 10 Mar. 2015.

SOUTH AFRICAN. Department of Basic Education. **Education for All (EFA)**. Country Progress Report. South Africa: Pretoria; Department of Basic Education, 2013.

SOUTH AFRICAN GOVERNMENT NEWS AGENCY. **BRICS education ministers discuss knowledge exchanges**. South African: Government News Agency website, 2013. Available at: <http://goo.gl/5vOTvb>. Accessed on: 12 Mar. 2015.

SOUZA, A. M. A legislação da Índia relativa ao uso e à propriedade da biotecnologia. **Boletim de Economia e Política Internacional**, n. 10, p. 47-60, 2012.

STATISTICS SOUTH AFRICA. **Mid-year population estimates, 2011**. Pretoria: Statistics South Africa. 2011.

_____. **Statistical release P0302**: mid-year population estimates. Pretoria: Statistics South Africa, 2014a.

_____. **Mortality and causes of death in South Africa, 2012**: findings from death notification. Pretoria: Statistics South Africa, 2014b.

STEUNKEL, O. Agriculture and food security: Brazil's chance to assume leadership among the BRICS. **Post-Western World website**, 2013. Available at: <http://goo.gl/lNk2ZR>. Accessed on: 12 Mar. 2015.

TETT, G. In a tech bubble with a twist, the big danger is bonds. **Financial Times**, 13 Mar. 2014. Available at: <http://goo.gl/Mb7xsm>. Accessed on: 10 Mar. 2015.

THE ECONOMIST. IMF influence: light-weight BRICS. **The Economist**, 6 June 2011. Available at: <http://goo.gl/tnsiwV>. Accessed on: 10 Mar. 2015.

THE TIMES OF INDIA. BRICS pledges $75 billion contribution to IMF's bailout fund. **The Times of India**, 19 June 2012. Available at: <http://goo.gl/fTDSSV>. Accessed on: 10 Mar. 2015.

THE WORLD BANK. **Toward a sustainable energy future for all**: directions for the World Bank Group's energy sector. Washington: The World Bank, 2013. Available at: <http://goo.gl/wsH7vF>. Accessed on: 10 Mar. 2015.

_____. **Annual Report**: 2014. Washington: The World Bank, 2014.

UN – UNITED NATIONS. **Charter of the United Nations**. San Francisco: UN, 1945. Available at: <http://goo.gl/xWdgyX>. Accessed on: 8 Apr. 2015.

_____. **A new global partnership**: eradicate poverty and transform economies through sustainable development – the report of the high-level panel of eminent persons on the post-2015 development agenda. New York: UN, 2013.

UNCTAD – UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT. **World Investment Report**: 2014. New York: UNCTAD, 2014. Available at: <http://goo.gl/fOZYeq>. Accessed on: 7 Apr. 2015.

UN-DESA – DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS. **World urbanization prospects, the 2011 Revision and updated with official national statistics**. New York: United Nations Department of Economic and Social Development, 2012. Available at: <http://goo.gl/ld2p9B>. Accessed on: 12 Mar. 2015.

UNESCO – UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION. Education for All Goals. **UNESCO website**. Available at: <http://goo.gl/70Bf2i>. Accessed on: 12 Mar. 2015.

_____. Unesco and BRICS Ministers of Education agree on basis for enhanced cooperation. **Unesco website**, 2013. Available at: <http://goo.gl/LuUNlX>. Accessed on: 12 Mar. 2015.

UNESCO INSTITUTE FOR STATISTICS. Educational attainment of the population aged 25 years and older – latest year available. **Unesco Institute for Statistics website**, 2014. Available at: <http://goo.gl/uc4QfD>. Accessed on: 12 Mar. 2015.

UN-HABITAT. **Scaling-Up Affordable Housing Supply in Brazil**. Nairobi: UN-Habitat, 2013.

UNITED NATIONS INTER-AGENCY AND EXPERT GROUP ON MILLENNIUM DEVELOPMENT GOALS. Millennium development goal indicators database. **UN MDGs website**, 2014. Available at: <http://mdgs.un.org>. Accessed on: 12 Mar. 2015.

UNODC – UNITED NATIONS OFFICE ON DRUGS AND CRIME. **World Drug Report**: 2011. Vienna: UNODC, 2011. Available at: <http://goo.gl/5gMaaO>. Accessed on: 9 Apr. 2015.

_____. **World Drug Report**: 2013. Vienna: UNODC, 2013. Available at: <http://goo.gl/d8A0Bi>. Accessed on: 9 Apr. 2015.

UNSDSN – SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK. **An action agenda for sustainable development**: report for the UN Secretary-General. Paris: UNSDSN, 2013. Available at: <http://goo.gl/acG2dA>. Accessed on: 7 Apr. 2015.

VAN DER BERG, S. **Fiscal incidence of social spending in South Africa, 2006**: a report to National Treasury. Stellenbosch: University of Stellenbosch, 2009. Available at: <http://goo.gl/hPXAWV>. Accessed on: 12 Mar. 2015.

WHEATLEY, J. Brazil sets 2% tax on capital inflows. **Financial Times**, 20 Oct. 2009. Available at: <http://goo.gl/UIxw8k>. Accessed on: 10 Mar. 2015.

WHO – WORLD HEALTH ORGANIZATION. WHO Global Infobase. **WHO website**. Available at: <http://goo.gl/kAlBu5>. Accessed on: 11 Mar. 2015.

_____. **Recommendations on wheat and maize flour fortification**. Meeting report: Interim Consensus Statement. Geneva: World Health Organization, 2006.

_____. WHO report on the global tobacco epidemic, 2008 – The MPOWER package. **WHO website**, 2008. Available at: <http://goo.gl/veYlFZ>. Accessed on: 11 Mar. 2015.

_____. **Global status report on noncommunicable diseases 2010**. Geneva: WHO, 2011. Available at: <http://goo.gl/hmyFwj>. Accessed on: 11 Mar. 2015.

_____. **Parties to the WHO framework convention on tobacco control**. WHO Framework Convention on Tobacco Control website, 2012. Available at: <http://goo.gl/Ele2wX>. Accessed on: 11 Mar. 2015.

_____. **World Health Statistics**. Geneva: WHO, 2013.

WORLD BANK. Goal 7: ensure environmental sustainability. **World Bank website**, 2014. Available at: <http://goo.gl/MTBmVq>. Accessed on: 12 Mar. 2015.

_____. Fossil fuel energy consumption (% of total). **World Bank website**, 2015. Available at: <http://goo.gl/GTtwxd>. Accessed on: 11 Mar. 2015.

WTO – WORLD TRAD ORGANIZATION. Members and observers. **WTO website**, 2015. Available at: <http://goo.gl/XXWeIO>. Accessed on: 10 Mar. 2015.

WU, J. Competition or complementarity? An empirical study on economic relationship among BRICS. **International Business**, n. 2, 2012.

ABBREVIATIONS AND ACRONYMS

ADB – Asian Development Bank

ART – Antiretroviral therapy

ARC – Agricultural Research Council

AU – African Union

BIS – Bank for International Settlements

BNDES – Brazilian National Development Bank

BRICS – Brazil, Russia, India, China and South Africa

BTTC – BRICS Think Tank Council

CAE – Chinese Academy of Engineering

Capes – Brazilian Coordination for the Improvement of Higher Education Personnel

CAS – Chinese Academy of Sciences

CBM – Common Berthing Mechanism

CELAC – Community of Latin American and Caribbean States

CERT – Computer Emergency Response Team

CGIAR – Consultative Group on International Agricultural Research

CHE – Council on Higher Education (South Africa)

CIP – Critical Infrastructure Programme (South Africa)

COP – Conference of Parties

DST – Department of Science and Technology (India/South Africa)

EFA – Education for All

EU – European Union

FAO – Food and Agriculture Organization

FDI – Foreign Direct Investment

FP7 – Seventh Framework Programme for Research and Technological Development (European Union)

FTA – Free trade agreement

G20 – Group of 20

GATT – General Agreement on Trade and Tariffs

GDP – Gross Domestic Product

GERD – Gross domestic R&D expenditures

HEI – Higher Education Institution

HQLA – High Quality Liquid Assets

IBRD – International Bank for Reconstruction and Development

ICPD – International Conference on Population and Development

ICT – Information and communication technology

IDA – International Development Association

IFC – International Finance Corporation

ILO – International Labour Organization

IMF – International Monetary Fund

INPE – National Institute of Space Research (Brazil)

LDC – Least developed country

LIC – Low-income country

Mapa – Ministry of Agriculture, Livestock and Food Supply (Brazil)

MCTI – Ministry of Science, Technology and Innovation (Brazil)

MDB – Multilateral Development Bank

MDG – Millennium Development Goal

MERCOSUR – Mercado Común del Sur

MIIT – Ministry of Industry and Information Technology (China)

MRC – Medical Research Council (South Africa)

MST – Ministry of Science and Technology (India)

NASSCOM – National Association of Software and Service Companies (India)

NCD – Non-communicable disease

NDB – New Development Bank

NDRC – National Development and Reform Commission (China)

NHI – National Health Insurance (South Africa)

NInC – National Innovation Council (India)

NIS – National Innovation System

NPC – National People's Congress (China)

NRU – National Research University (Russia)

NSFAS – National Student Financial Aid Scheme (South Africa)

NSFC – National Science Foundation of China

OECD – Organisation for Economic Co-operation and Development

ODI – Outward Direct Investment

OIE – International Epizootic Office

PPP – Purchasing Power Parity

PPD – Population and Development and Experts on Population Matters

PIR – Center for Policy Studies (Russia)

PRC – People's Republic of China

PTA – Preferential trade agreement

QE – Quantitative Easing

RMB – Renminbi

RTA – Regional trade agreement

R&D – Research and development

SAARC – South Asian Association for Regional Cooperation

SDG – Sustainable Development Goal

SDR – Special Drawing Rights

SIFI – Systemically Important Financial Institutions

SKA – Square Kilometer Array

SME – Small and medium-sized enterprise

STI – Science, technology and innovation

TB – Tuberculosis

THRIP – Technology and Human Resources for Industry Programme (South Africa)

TIA – Technology Innovation Agency (South Africa)

TRIPS – Agreement on Trade-Related Aspects of Intellectual Property

UAV – Unmanned aerial vehicle

UCAV – Unmanned combat air vehicle

UMP – Unconventional monetary policy

UN – United Nations

UNCTAD – United Nations Conference on Trade and Development

UNDP – United Nations Development Programme

UNFCCC – United Nations Framework Convention on Climate Change

UN IAEG – United Nations Inter-Agency and Expert Group

UNODC – United Nations Office on Drugs and Crime

UNSC – United Nations Security Council

USA – United States of America

USD – United States Dollar

WHO – World Health Organization

WTO – World Trade Organization

Composed in adobe garamond 11/13.2 (text)
Frutiger 67 bold condensed (headings, graphs and tables)
Brasília – DF – Brazil