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GLOBAL INNOVATION INDEX 2018

Energizing the World with Innovation

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Confederation of Indian Industry

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SEBRAE

CNI
National Confederation of Industry
Brazil
CNI. THE STRENGTH OF THE BRAZILIAN INDUSTRY

Introduction to the Global Innovation Index

- 11th year of publication.
- Measures innovation across 126 countries.
- Recognizes innovation as driver of economic growth.
- Leading reference for innovation.
- A ‘tool for action’ for decision makers.
- Holistic approach to innovation applicable to developed and emerging economies.


江山入畫圖


“Let us aim for India to be among the top 10 countries in the Global Innovation Index by 2030”
PM Modi, March 2018


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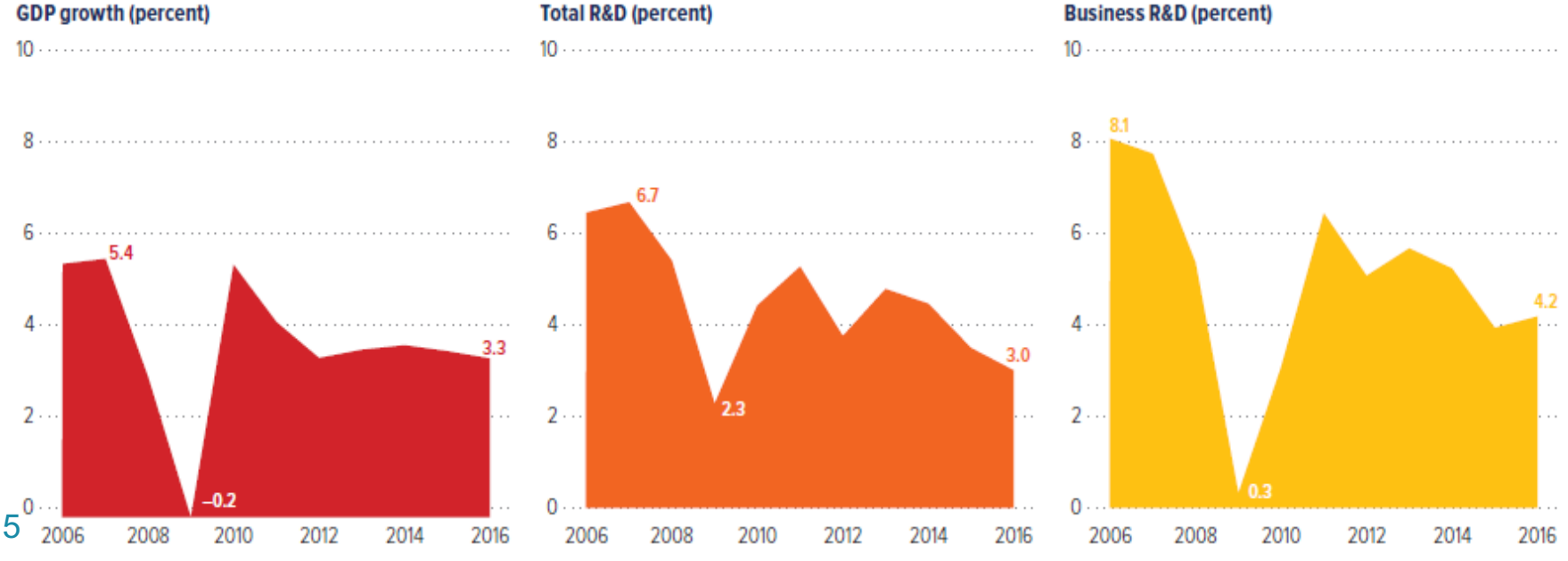
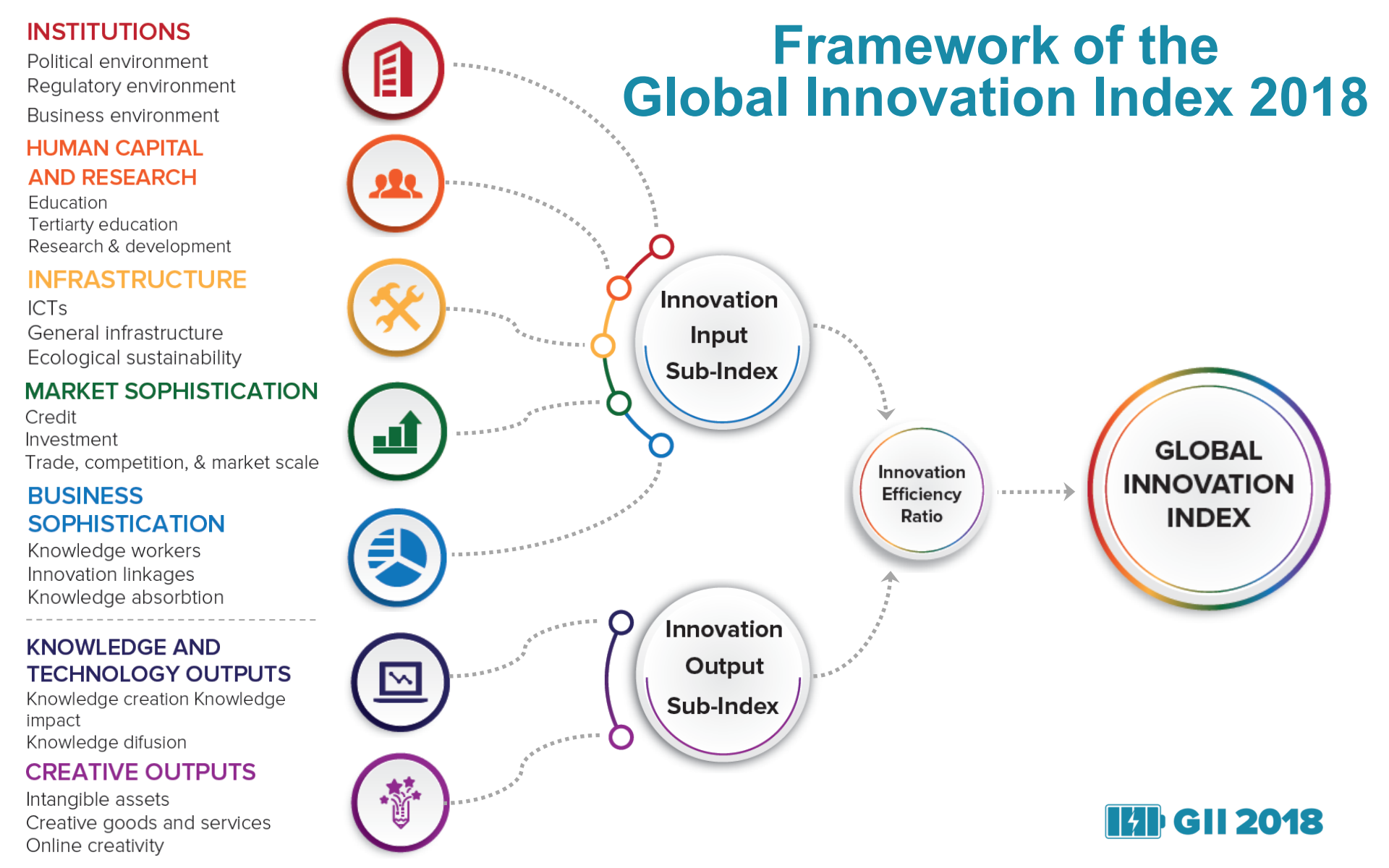
Optimism about global innovation & growth is possible

- Global R&D expenditures more than doubled between 1996-2016
- In 2016, worldwide total R&D expenditure (GERD) grew at 3%
- Global business R&D spending increased faster in 2016 (4.2%) than in 2015.
- But downside risks prevail that need to be countered with innovation-driven growth.

Global R&D expenditures growth, 2006–16



Framework of the Global Innovation Index 2018



Rankings of the GII 2018

Global rankings of GII 2018 (top 10)

Input

1. Singapore
2. Switzerland
3. Sweden
4. United Kingdom
5. Finland
6. USA
7. Denmark
8. Hong Kong (China)
9. Netherlands
10. Canada

Output

1. Switzerland
2. Netherlands
3. Sweden
4. Luxembourg
5. Germany
6. United Kingdom
7. USA
8. Finland
9. Ireland
10. China

GII

1. Switzerland
2. Netherlands
3. Sweden
4. United Kingdom
5. Singapore
6. USA
7. Finland
8. Denmark
9. Germany
10. Ireland

Income group rankings (top 3)

High Income

- Switzerland (1)
- Netherlands (2)
- Sweden (3)

Upper-middle Income

- China (17)
- Malaysia (35)
- Bulgaria (37)

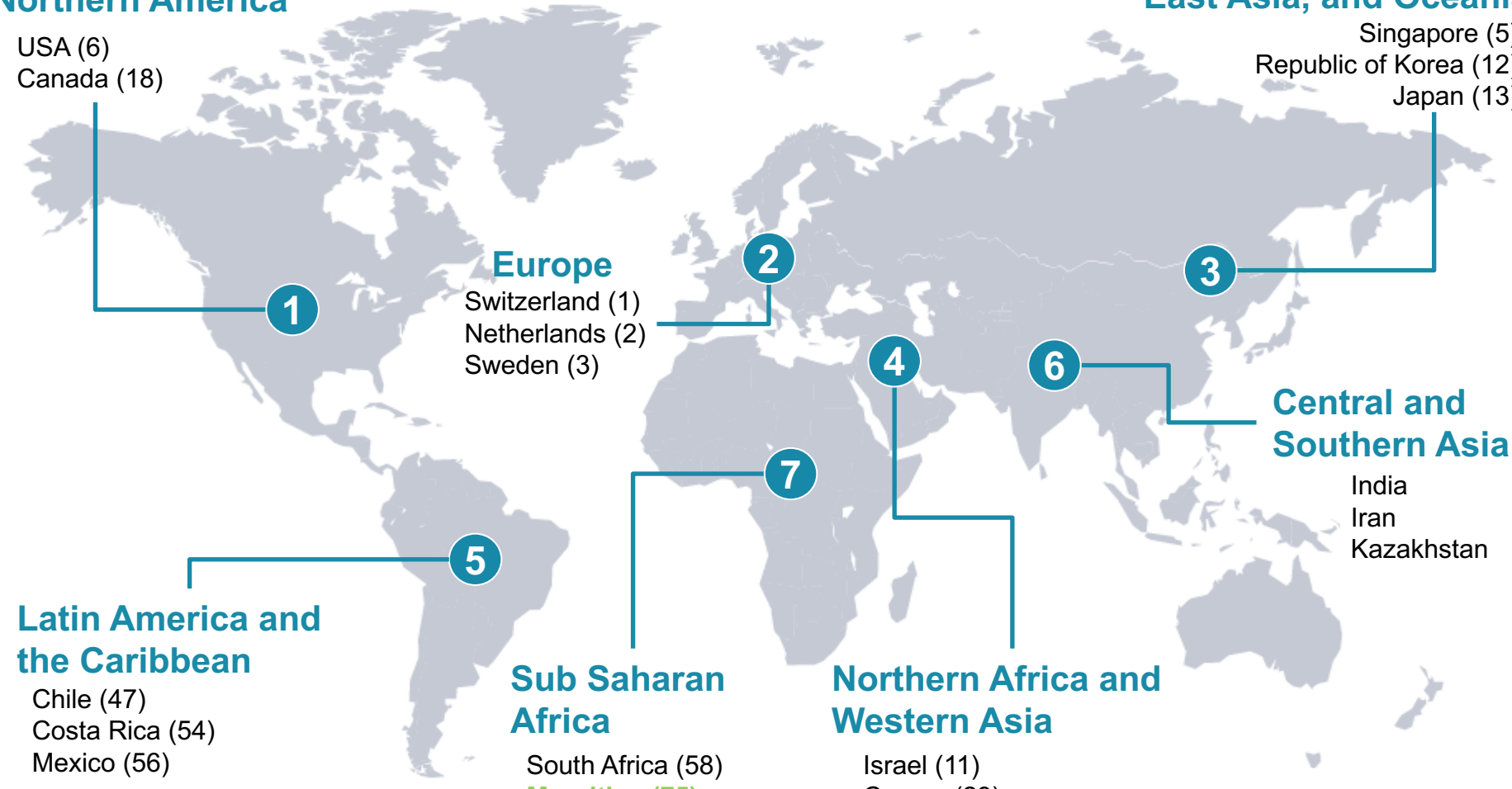
Lower-middle Income

- Ukraine (43)
- Viet Nam (45)
- Rep. of Moldova (48)

Low Income

- United Rep. of Tanzania (92)
- Rwanda (99)
- Senegal (100)

Region group rankings (top 3)



Northern America

USA (6)
Canada (18)

South East Asia, East Asia, and Oceania

Singapore (5)
Republic of Korea (12)
Japan (13)

Europe

Switzerland (1)
Netherlands (2)
Sweden (3)

Central and Southern Asia

India
Iran
Kazakhstan

Latin America and the Caribbean

Chile (47)
Costa Rica (54)
Mexico (56)

Sub Saharan Africa

South Africa (58)
Mauritius (75)
Kenya (78)

Northern Africa and Western Asia

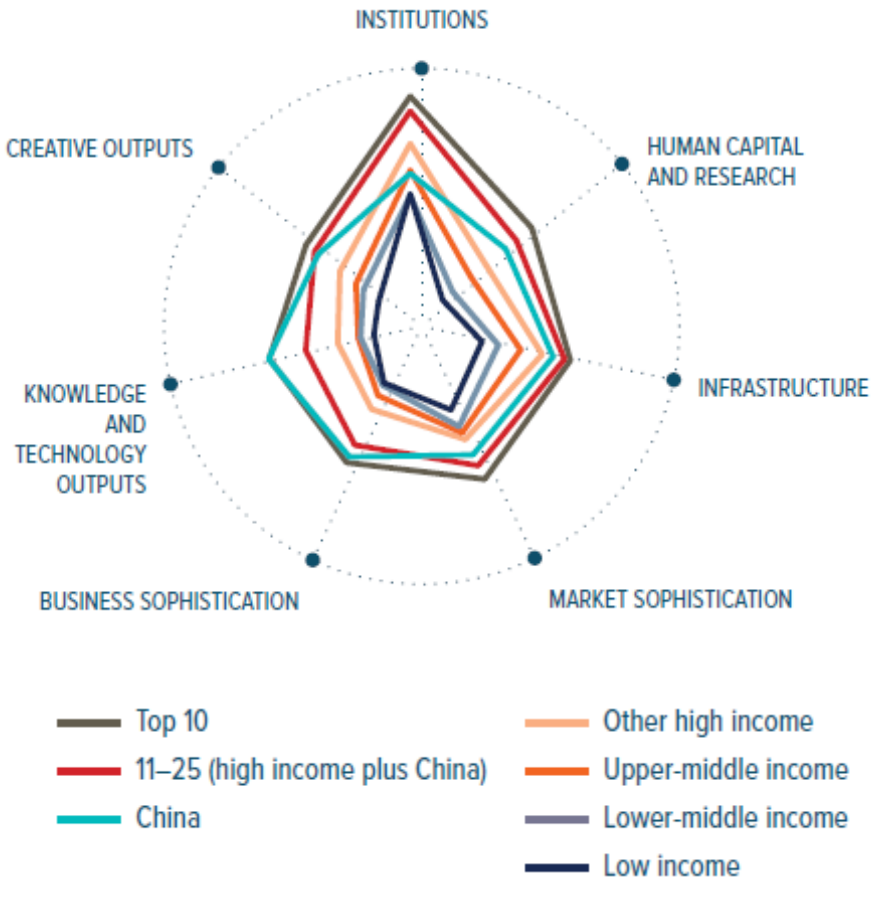
Israel (11)
Cyprus (29)
UAE (38)

Key Messages and Recommendations

1) China's rise shows the way for middle-income economies

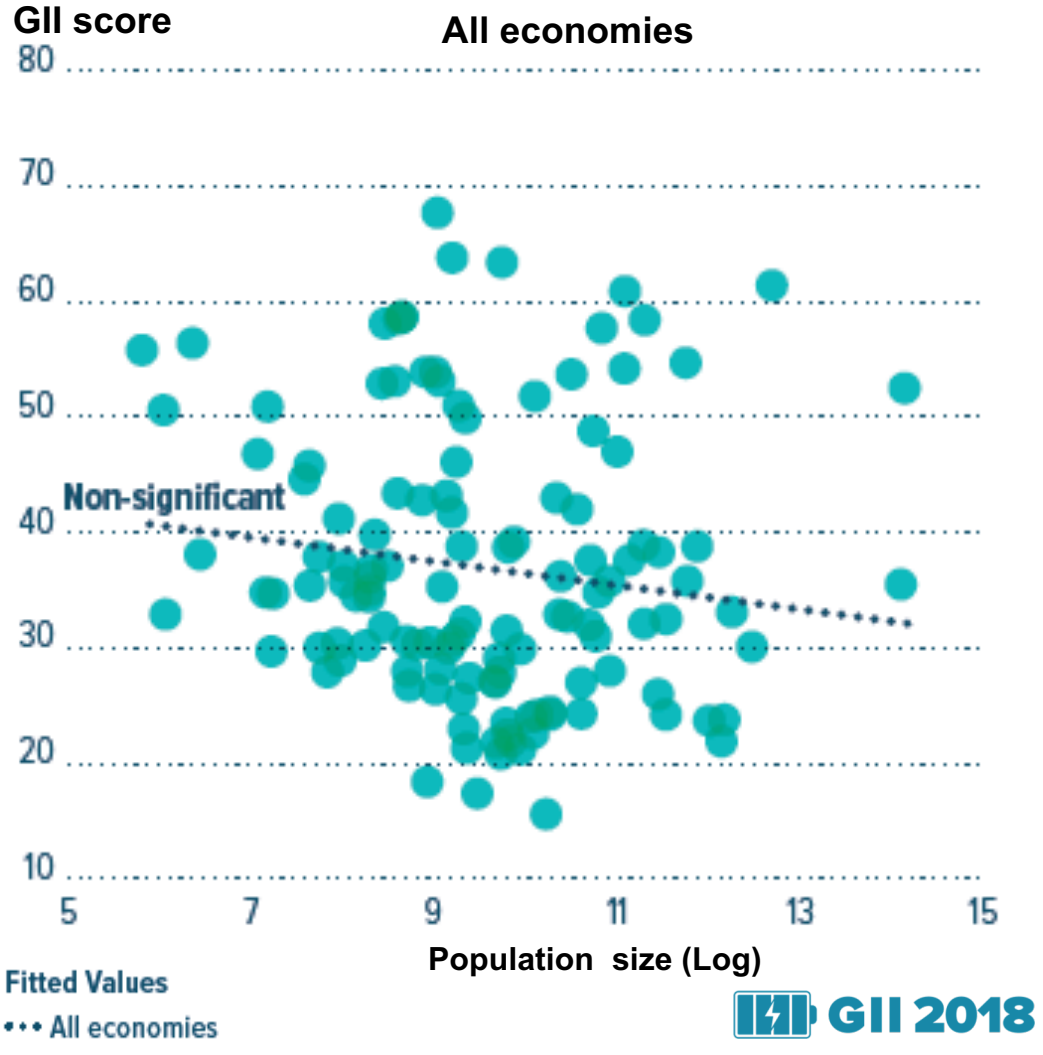
- The global innovation divide remains wide.
- High-income economies leading in innovation.
- Since 2016 China in the top 25 (17th), now focus on the quality of innovation.
- Malaysia (35th) and Bulgaria (37th), edging closer to the top 25.
- Thailand, the Islamic Republic of Iran (65th), and Viet Nam: big movers.

Innovation divide: Stable at top 10, China moving up



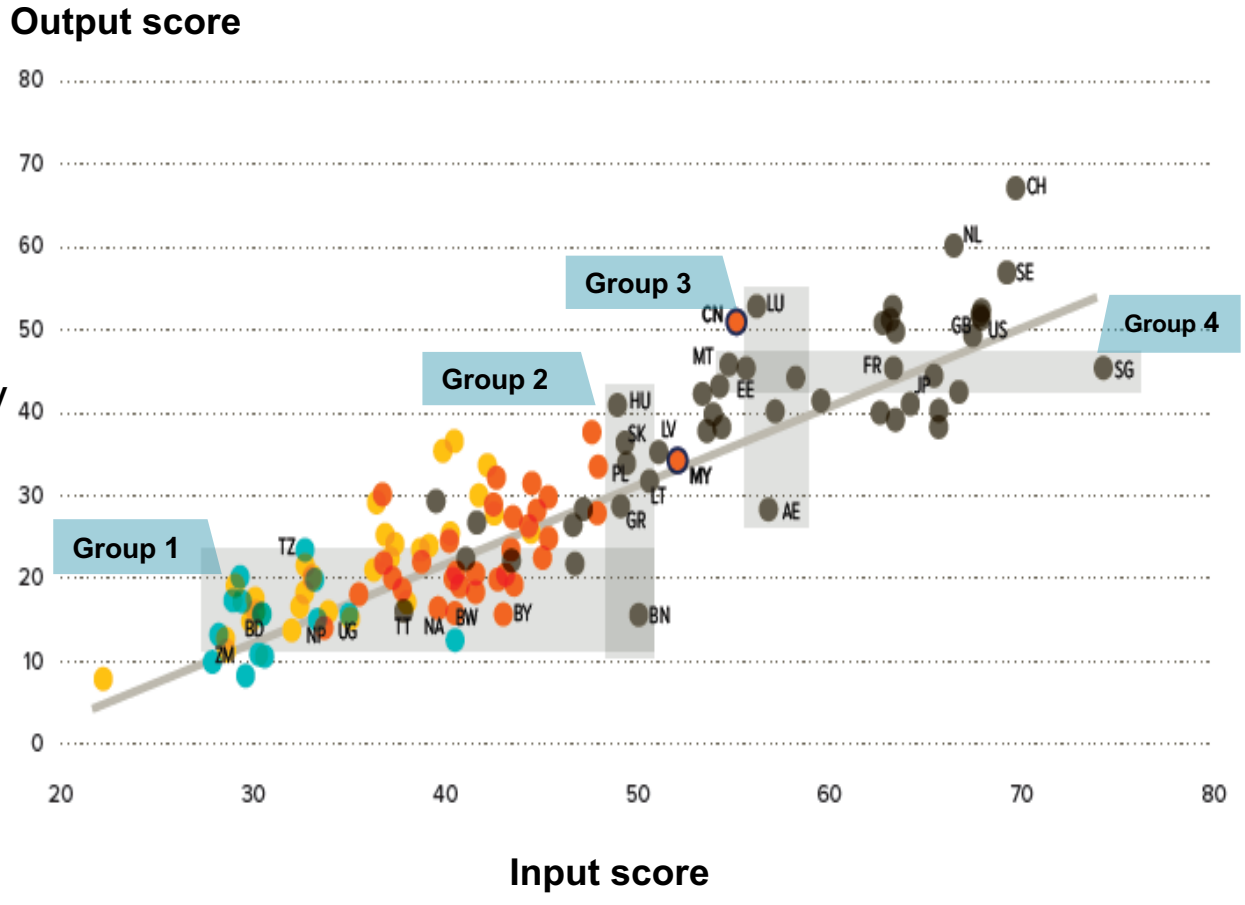
2) Richer, diverse & open economies score high in innovation

- Both large and small countries can score high on the GII.
- Richer, diverse, and open economies tend to be more innovative.
- Economies with more diversified portfolios are more innovative.



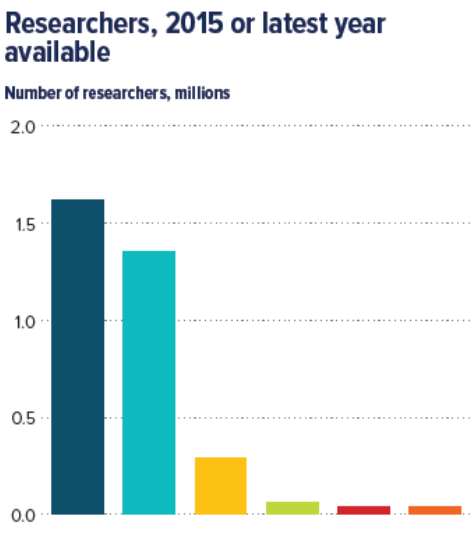
3) Translating innovation investments into results is key

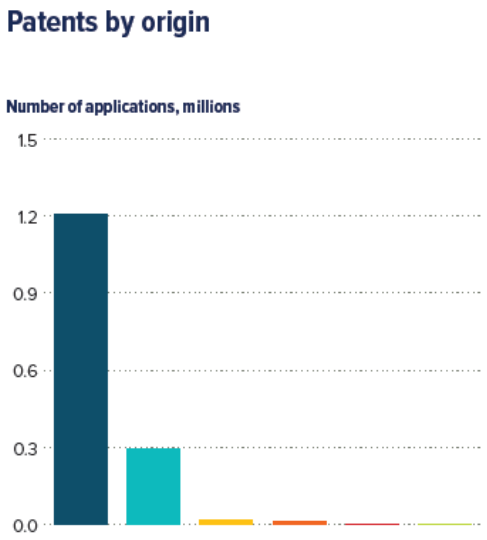
- Despite efforts some economies do not generate corresponding levels of innovation outputs.
- Key outliers that strongly over- or under-deliver, like Switzerland for more; but some for less
- China strongly over-performs but also Viet Nam for example

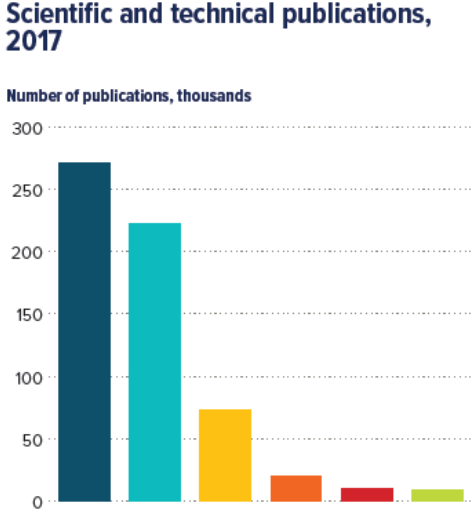


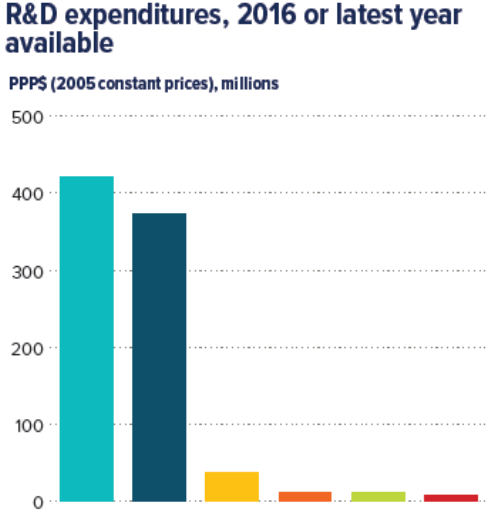
GII 2018

4) Strong regional innovation imbalances persevere









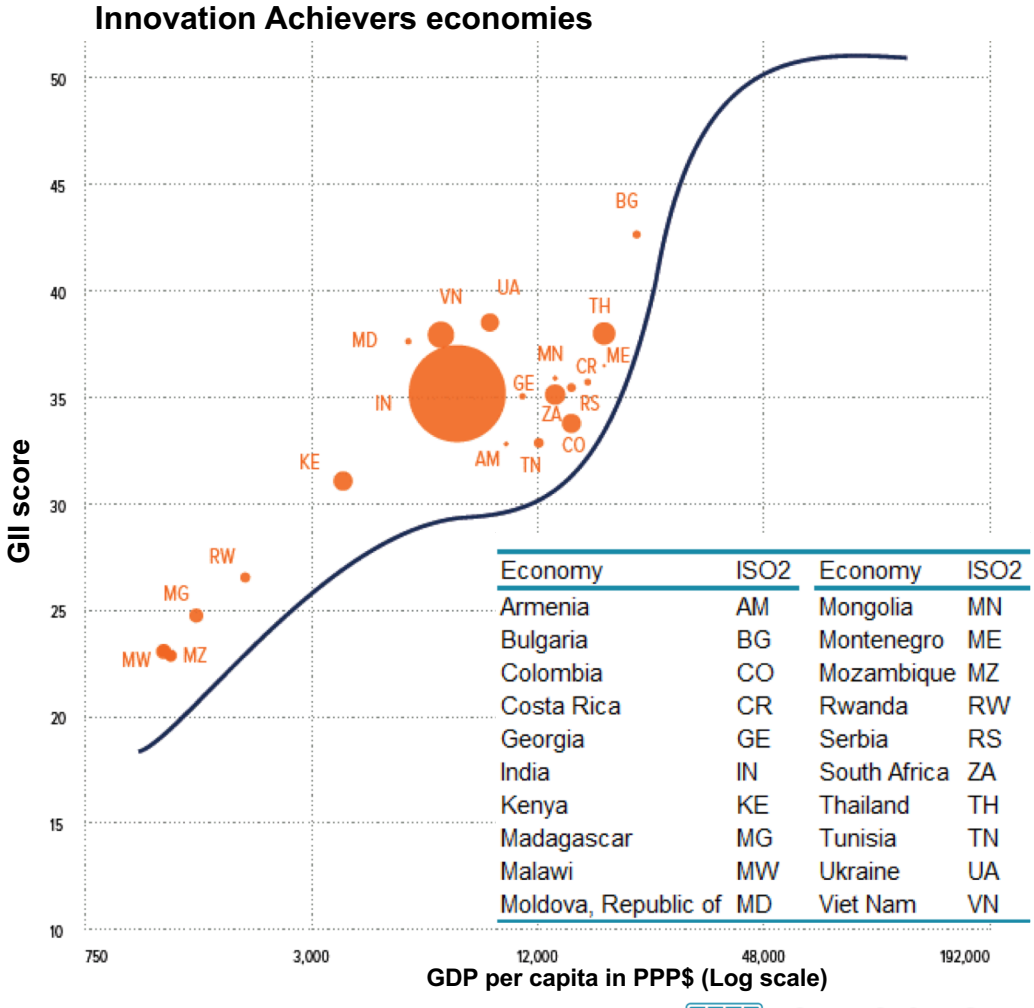
- Large high-income economies, and China, overshadow small countries in absolute innovation.
- U.S. and China the largest contributors in absolute, unscaled innovation inputs and outputs.

China
U.S.
U.K.
Israel
Singapore
Switzerland

GII 2018

5) Countries that do more with less: Innovation Achievers

- 20 countries outperform on innovation relative to their level of development.
- Colombia, Tunisia, and South Africa new entrants to this group
- Sub-Saharan Africa with the most from any region (six in total).



Economy	ISO2	Economy	ISO2
Armenia	AM	Mongolia	MN
Bulgaria	BG	Montenegro	ME
Colombia	CO	Mozambique	MZ
Costa Rica	CR	Rwanda	RW
Georgia	GE	Serbia	RS
India	IN	South Africa	ZA
Kenya	KE	Thailand	TH
Madagascar	MG	Tunisia	TN
Malawi	MW	Ukraine	UA
Moldova, Republic of	MD	Viet Nam	VN

Sub Saharan Africa in the GII 2018

Sub Saharan Africa rankings of GII 2018 (top 10)

Input

1. South Africa (48)
2. Mauritius (61)
3. Rwanda (73)
4. Botswana (74)
5. Namibia (80)
6. **Kenya (91)**
7. Uganda (98)
8. Senegal (102)
9. Tanzania, United Republic of (106)
10. Ghana (108)

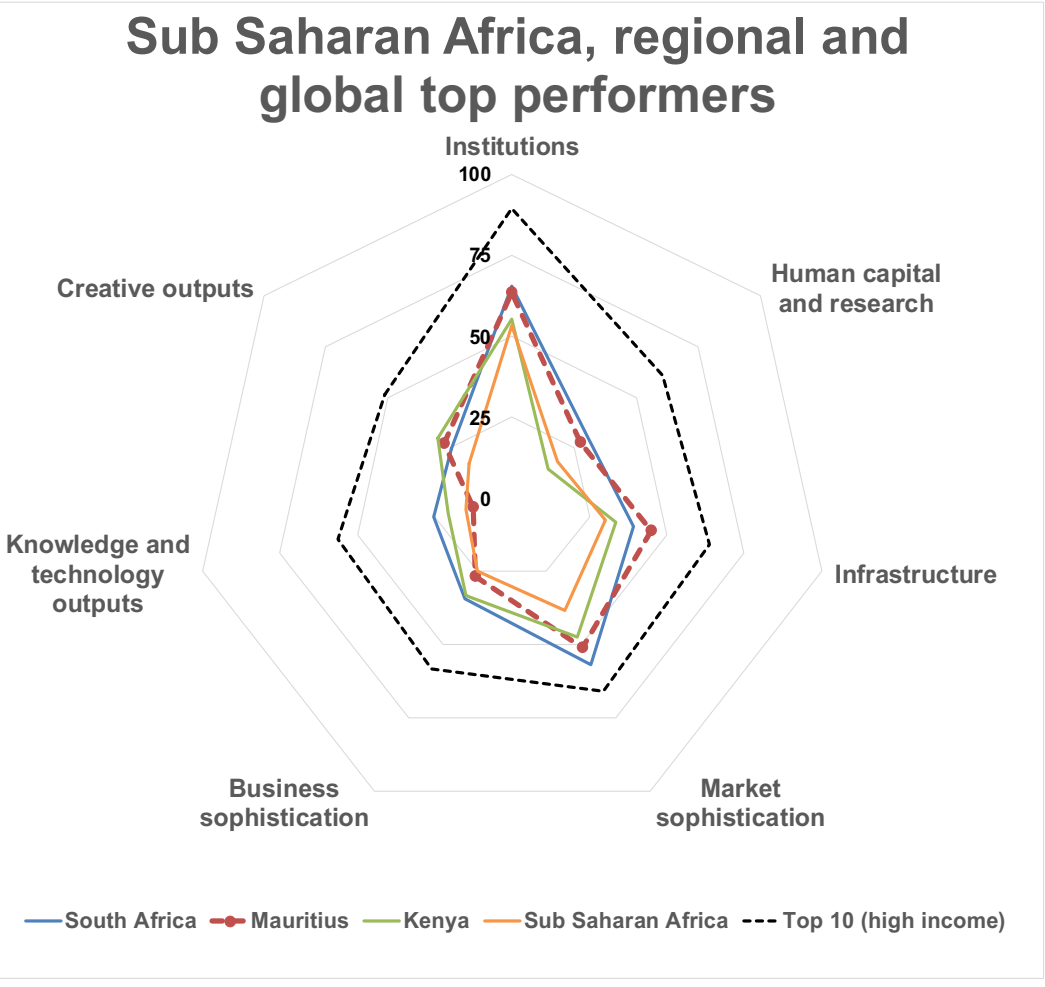
Output

1. **Kenya (64)**
2. South Africa (65)
3. Tanzania, United Republic of (71)
4. Madagascar (85)
5. Mauritius (89)
6. Senegal (90)
7. Cameroon (98)
8. Zimbabwe (99)
9. Mali (100)
10. Ghana (102)

GII

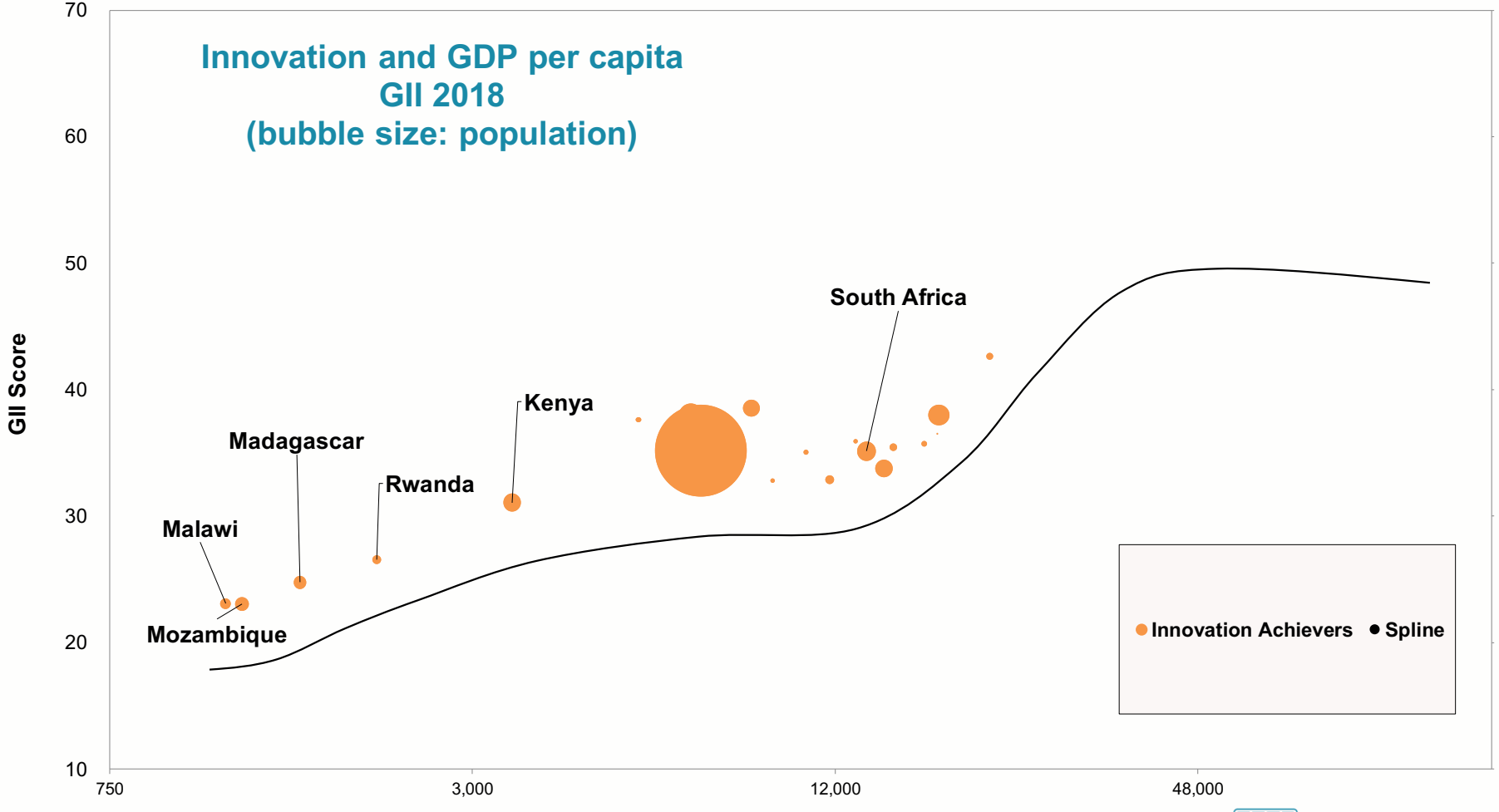
1. South Africa (58)
2. Mauritius (75)
3. **Kenya (78)**
4. Botswana (91)
5. Tanzania, United Republic of (92)
6. Namibia (93)
7. Rwanda (99)
8. Senegal (100)
9. Uganda (103)
10. Madagascar (106)

Sub Saharan Africa in the GII 2018



- Sub Saharan Africa performs relatively well on innovation. Yet, shows the least growth in overall score among regions.
- Since 2012 the region has had more countries among the group of innovation achievers than any other region.
- It is important for Africa to preserve its current innovation momentum.
- Kenya: good performance in Institutions, Business sophistication, and Creative outputs.

Sub Saharan Africa: Innovation Achievers in the GII 2018



GII 2018

Sub Saharan Africa: Income group performance

Global Innovation Index	Innovation Input Sub-index	Innovation Output Sub-index	Innovation Efficiency Ratio
Upper-middle-income economies (34 in total)			
	6 South Africa (48)		
Lower-middle-income economies (30 in total)			
		9 Kenya (64)	6 Kenya (41)
Low-income economies (15 in total)			
1 **Tanzania, United Rep. (92)**	Rwanda (73)	**Tanzania, United Rep. (71)**	**Tanzania, United Rep. (31)**
2 Rwanda (99)	**Uganda (98)**	Madagascar (85)	Madagascar (40)
3 **Senegal (100)**	**Nepal (101)**	**Senegal (90)**	Zimbabwe (69)
4 **Uganda (103)**	**Senegal (102)**	Zimbabwe (99)	**Senegal (70)**
5 Madagascar (106)	**Tanzania, United Rep. (106)**	Mali (100)	Mali (73)
6 **Nepal (108)**	Benin (110)	**Malawi (108)**	**Mozambique (88)**
7 Mali (112)	**Malawi (111)**	**Mozambique (109)**	**Malawi (89)**
8 Zimbabwe (113)	**Mozambique (112)**	**Uganda (111)**	Guinea (102)
9 **Malawi (114)**	Niger (113)	**Nepal (114)**	**Nepal (107)**
10 **Mozambique (115)**	Burkina Faso (117)	Guinea (118)	**Uganda (108)**

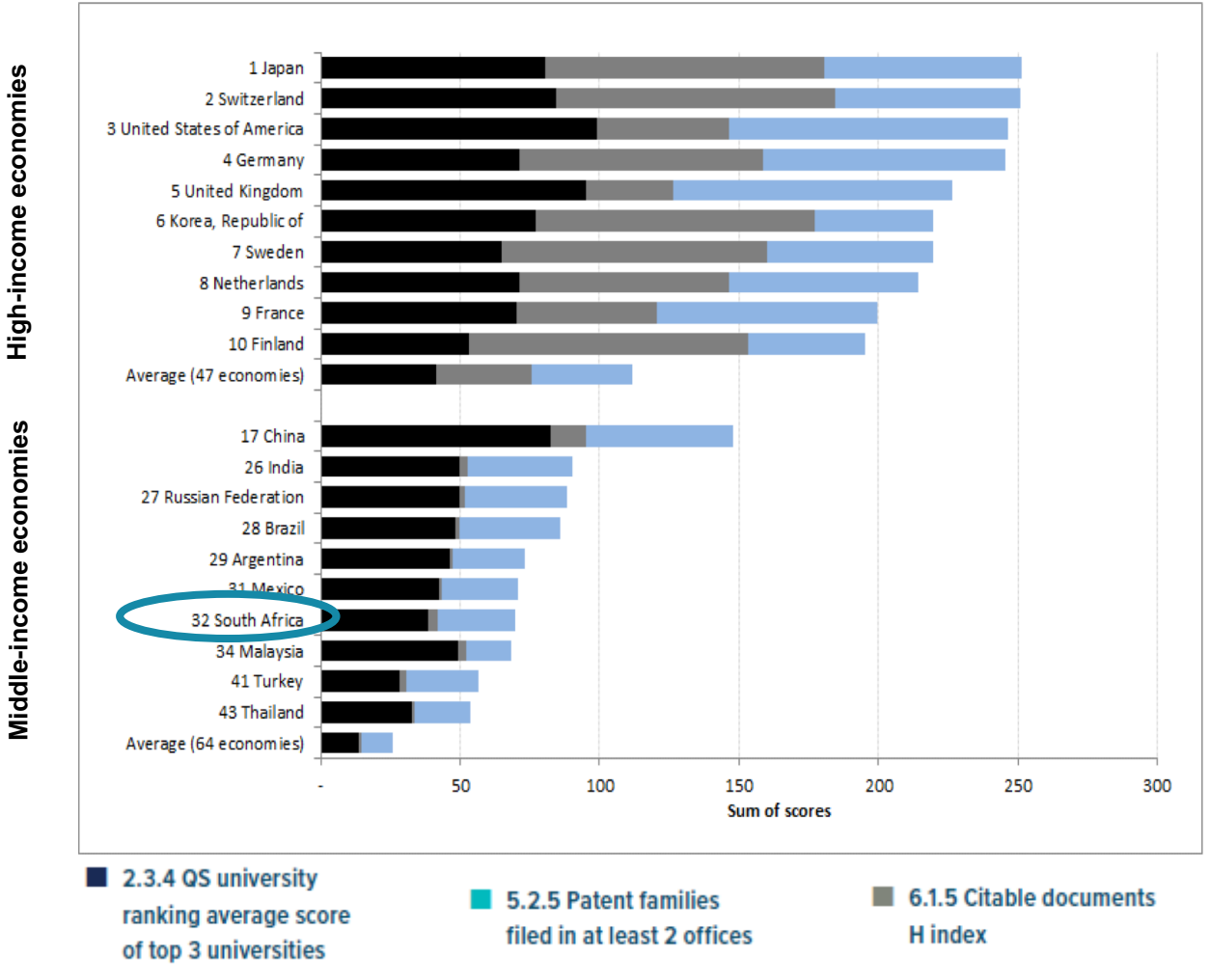
- At the Low-income level, Sub-Saharan Africa takes top spots in leading performance.

Sub Saharan Africa: Quality of innovation

Innovation quality is becoming a policy goal.

- South Africa in Top 10 middle-income economies.
- Ranks 6th among middle-income economies and 32nd overall.

Metrics for quality of innovation: Top 10 high- and top 10 middle-income economies



Overall results and Kenya in the GII 2018

Kenya's ranking over time				
	GII	Input	Output	Efficiency
2018	**78**	**91**	**64**	**41**
2017	**80**	**91**	**70**	**50**
2016	**80**	**97**	**65**	**30**
2015	**92**	**113**	**78**	**30**

- Kenya at 78th, third in the Sub Saharan Africa region and 11th among Lower-middle income group.
- Kenya improves performance in Innovation Output but remains at the level of 2017 in Inputs.
- With a 90% confidence, Kenya expected rank is between 70th and 80th.

Kenya in the GII 2018: A performance with potential for improvement

- **Innovation linkages**; University/industry research collaboration; GERD financed by abroad; High-tech net imports.
- **Creative goods & services**; Printing & other media.
- **Credit**; Ease of getting credit; Microfinance gross loans; Intensity of local competition.
- Intellectual property receipts; ICT services exports.

- ○ Political stability & safety
- ○ Electricity output; **Ecological sustainability**; GDP/unit of energy use
- ○ **Human capital & research**; Pupil-teacher ratio; **Tertiary education**; Tertiary enrolment; Global R&D companies, top 3.

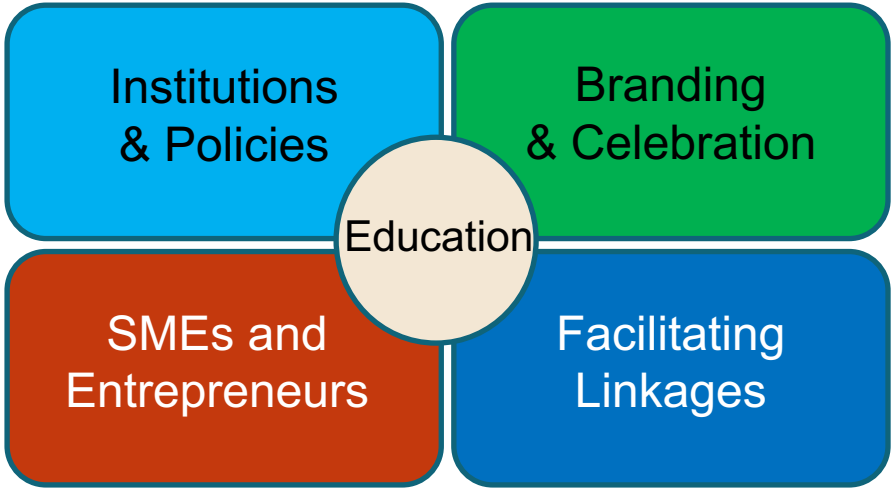
● Strength; ○ Weakness.

Kenya in the GII 2018: Strengths and areas of opportunity

Strengths	Weaknesses
1.2.3 Cost of redundancy dismissal, salary weeks (1)	1.1.1 Political stability & safety (118)
4.1. Credit (22)	**2. Human capital & research (112)**
4.1.1 Ease of getting credit (26)	2.1.5 Pupil-teacher ratio, secondary (105)
4.1.3 Microfinance gross loans, % GDP (9)	**2.2. Tertiary education (120)**
4.3.2 Intensity of local competition (29)	2.2.1 Tertiary enrolment, % gross (114)
5.2. Innovation linkages (9)	2.3.3 Global R&D companies, top 3, in mn US$ (40)
5.2.1 University/industry research collaboration (31)	3.2.1 Electricity output, kWh/cap (112)
5.2.3 GERD financed by abroad, % (4)	**3.3. Ecological sustainability (117)**
5.3.2 High-tech net imports, % total trade (32)	3.3.1 GDP/unit of energy use (104)
6.3.1 Intellectual property receipts, % total trade (29)	4.3.1 Applied tariff rate, weighted mean, % (115)
6.3.3 ICT services exports, % total trade (19)	5.3.3 ICT services imports, % total trade (119)
7.2. Creative goods & services (26)	7.2.1 Cultural & creative services exports, % total trade (83)
7.2.4 Printing & other media, % manufacturing (1)	7.3.4 Mobile app creation/bn PPP$ GDP (86)

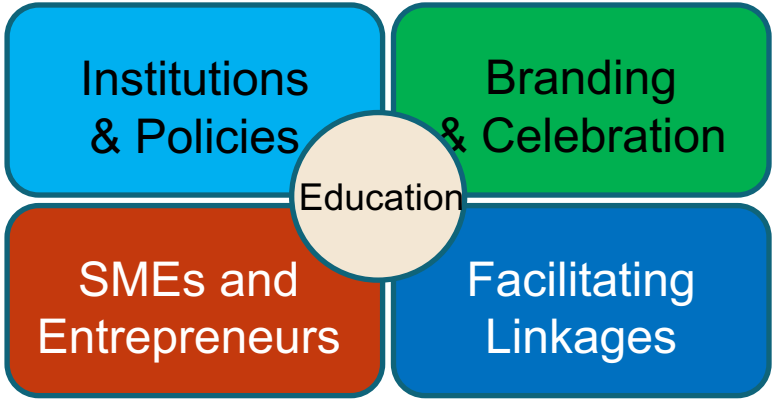
Africa: Perspectives and recommendations

Innovation ecosystems



Innovation Ecosystem – Education

- Necessary education reform
- Focus on STEM subjects
- High quality universities
- International exchange



Innovation in Africa

Ongoing improvement of the quality of university education in Africa.

- Promote a continuous expansion of the range of education areas and topics in local universities.
- Increase transfer of learning from the university to the larger society through various linkages.
- Focus on matching context in which the knowledge or skill is acquired to the context in which the knowledge or skill is to be practiced.

Source: E. Fredua-Kwarteng & S.K.Ofosu (2018); *Improving the quality of university education in Africa*. University World News. Issue No:496.

Innovation in Africa

Collaboration in the region in the areas of the Science, Technology and Innovation (STI)

- The African Union (AU) and its Science and Technology Division have so far taken certain steps to advance the continent's scientific standing.

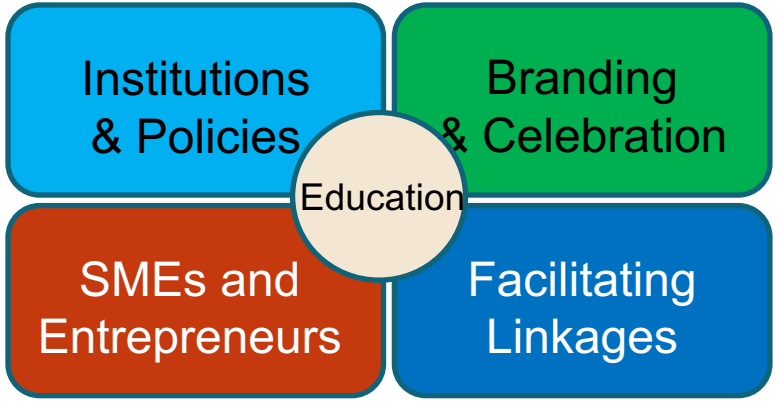
Examples are:

- Africa's Science and Technology Consolidated Plan of Action
- The Kwame Nkrumah Scientific Awards Programme
- The Science, Technology and Innovation (STI) Strategy for Africa 2024
- EU-Africa Cooperation in STI
- The Scientific Technical Research Commission
- The African Scientific Research and Innovation Council, and
- The African Observatory of Science, Technology and Innovation.

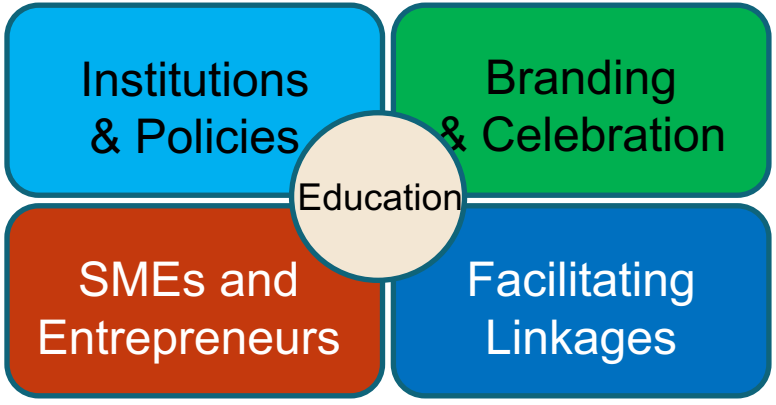
Source: R. M. Ayoubi & E. Akcay (2018); *A unique opportunity to promote scientific collaboration*. University World News. Issue No:525.

Innovation Ecosystem – Institutions and Policies

- Political leadership
- Quality and stability of regulation
- Ease of doing business
- Support for R&D investments

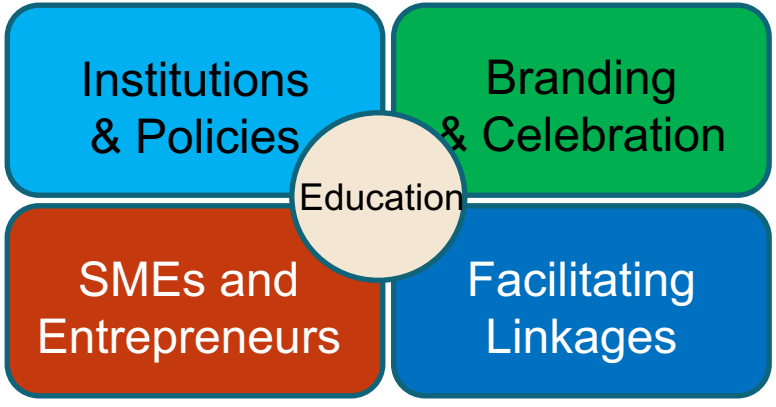


Innovation Ecosystem – SMEs and Entrepreneurs



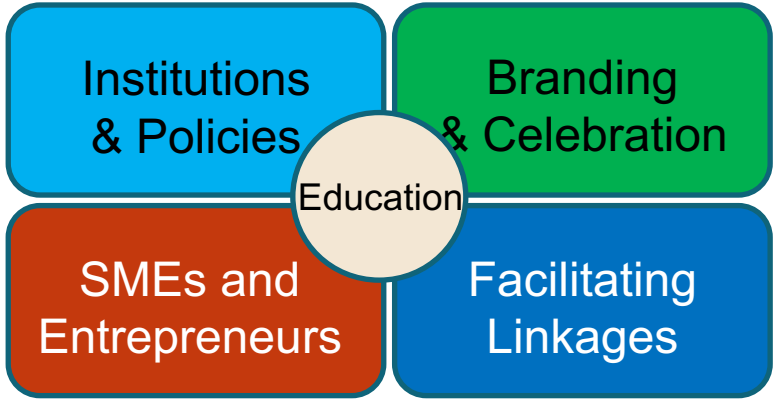
- Attract and retain entrepreneurs
- Provide access to capital
- Enable use of technology
- Support market access

Innovation Ecosystem – Facilitate Linkages



- Support university-industry collaborations
- Facilitate links to global knowledge (IP)
- Stimulate industry focused ecosystems
- Encourage networks of entrepreneurs

Innovation Ecosystem – Branding & Celebration



- Celebrate successful entrepreneurs
- Bring entrepreneurs closer to students
- Clarify and focus on strengths
- Build brand in key markets

Innovation in Sub Saharan Africa

Readiness to adopt new (and possibly disruptive) technologies and to face new global challenges.

- Technological change and digitalization has induced a new production revolution in Africa.
  - African firms can now access new markets, produce at lower cost and tap new equity markets.
  - African governments can deliver basic services more efficiently and transparently.
- Africa already counts over 277 million registered mobile money accounts, more than all other developing regions put together.
  - Mobile money in Kenya is used by at least one individual in 96% of households (with a total of 5 million households in the country, 96% of which have a mobile phone).

Source: AUC/OECD (2018), Africa's Development Dynamics 2018: Growth, Jobs and Inequalities, AUC, Addis Ababa/OECD Publishing, Paris.
T.Suri & W.Jack (2018) *The long-run poverty and gender impacts of mobile money. Science. 354* (6317), 1288-1292.

Innovation in Sub Saharan Africa

Readiness to adopt new (and possibly disruptive) technologies and to face new global challenges *(continued…)*

- However, robotization brings big risks for Africa's industrialization.
  - In Ethiopia, 85% of jobs are in sectors susceptible to automation.
- There are over 20 artificial intelligence start-ups in South Africa only:
  - *DataProphet*, *Aerobotics*, and *MySmartFarm* are a few examples which are supported by incubators such as the local Standard Bank.

In general all these start-ups employ artificial intelligence techniques to find solutions to problems with the aim of improving productivity and economic growth.

Source: AUC/OECD (2018), Africa's Development Dynamics 2018: Growth, Jobs and Inequalities, AUC, Addis Ababa/OECD Publishing, Paris.
T.Suri & W.Jack (2018) *The long-run poverty and gender impacts of mobile money. Science. 354* (6317), 1288-1292.

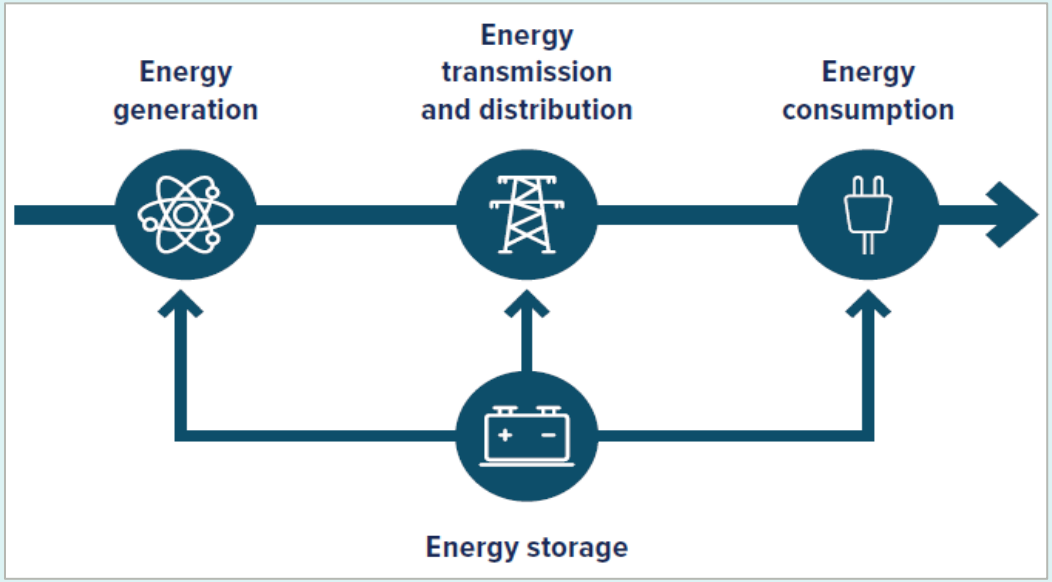
Conclusion

- Rapid transformation and success in innovation is possible
- But it needs first and foremost strong leadership with a vision
- And the courage and perseverance to bring key stakeholders together
- To create a position of global strength in the era of Industry 4.0

Theme and Special Sections

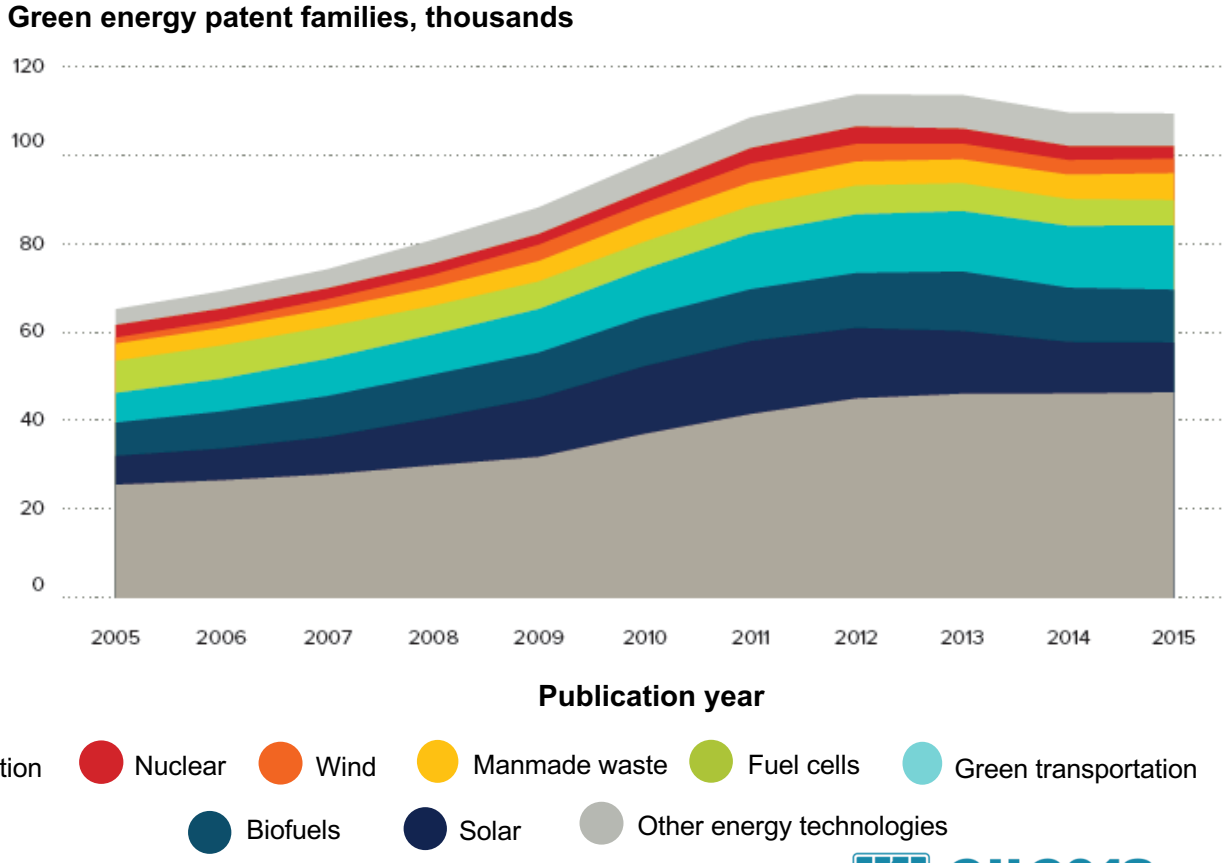
2018 GII THEME: Energizing the World with Innovation

- Innovation is key in global energy demand.
- Energy innovations are happening globally; objectives differ across countries.
- New energy innovation systems are needed with efforts along all stages.
- Obstacles to adoption and diffusion remain numerous.
- Public policy plays a central role in driving the energy transition.



Green energy inventions: accelerated growth and slow decline

- The total number of patents doubled between 2005 and 2013
- Since then a decrease in the number of patent families and PCT international patent applications has been observed every year



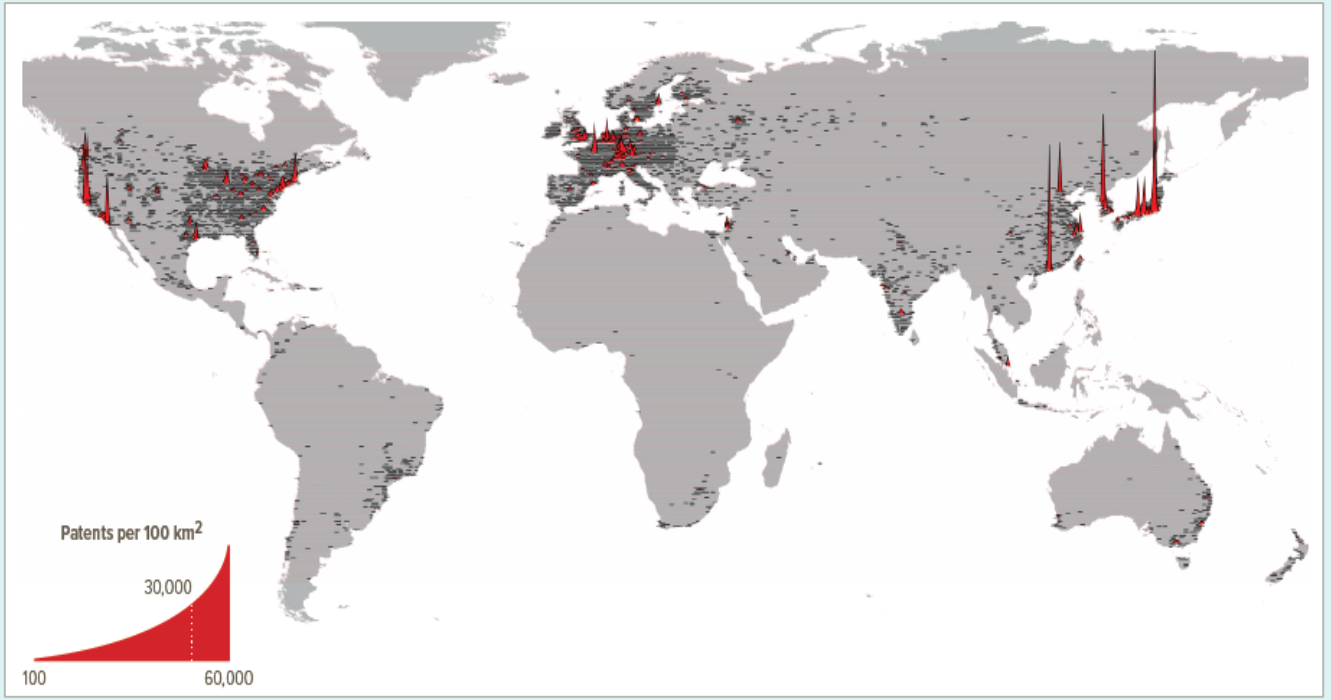
Public policy plays a central role in driving the energy transition

- Policy makers have a responsibility to provide funding mechanisms that can stimulate innovation.
- Governments play the role of risk taker:
  - By promoting mechanisms that stimulate investment and the diffusion of technologies with disruptive potential
  - By supporting projects with high technological risk

- Technological cooperation and innovation networks are an important element of an innovation ecosystem
- Favorable regulatory frameworks can incentivize energy innovations.

Most top S&T clusters are in U.S., China, Germany

- **U.S.** (26), **China** (16),**Germany** (8), the **U.K.** (4), and **Canada** (4).
- **Tokyo–Yokohama** tops ranking, followed by **Shenzhen–Hong Kong**.
- Aside **China**, clusters from middle-income economies like **Brazil**, **India**, and Islamic Republic of **Iran** also make the **top 100 list**.



Top science and technology clusters

Overall Rank	Cluster name	Patent rank	Scientific publication rank
1	Tokyo–Yokohama	1	2
2	Shenzhen–Hong Kong (China)	2	1
3	Seoul	3	3
4	San Jose–San Francisco, CA	4	10
5	Beijing	8	1
6	Osaka–Kobe–Kyoto	5	13
7	Boston–Cambridge, MA	9	6
8	New York, NY	11	4
9	Paris	10	9
10	San Diego, CA	7	41

Special Section by - Kyle Bergquist, Carsten Fink, and Julio Raffo

Theme Conclusions and Recommendations

1. A broad-based global economic growth momentum is now in place.
2. Investment in energy innovations essential for growth and the environment.
3. China's rapid rise shows the way for other middle-income economies.
4. Richer, industry- and export-diverse economies likelier to lead in innovation.
5. Translating innovation investments into results is key.
6. Regional innovation imbalances continue to hamper development.
7. Most top S&T clusters are in the U.S., China, and Germany.

GLOBAL INNOVATION INDEX 2018

Energizing the World with Innovation

Annexes