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The Global Innovation Index 2014
The Human Factor in Innovation

Taking stock of national systems of innovation in developing & developed countries and economies in transition

Workshop of the Technology Executive Committee of the UNFCCC
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We all know what innovation is ...

- ‘Creative destruction’ – Schumpeter
- ‘Innovation is the implementation of a new or significantly improved product (good or service), process, new marketing method or a new organisational method in business practices, workplace organisation or external relations.’¹

1. Source: OECD (2005) *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd edition, OECD and European Commission.



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Innovations only 'take'

...if the ecosystem (supply chain) can absorb them



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Ways to assess national innovation capacity:

- formal review of a national innovation system
- using multi-factor indices that take account of innovation outputs & the innovation ecosystem (such as the Global Innovation Index)

Some useful multifactor indices:

innovation indices in red; environment & energy indices in green

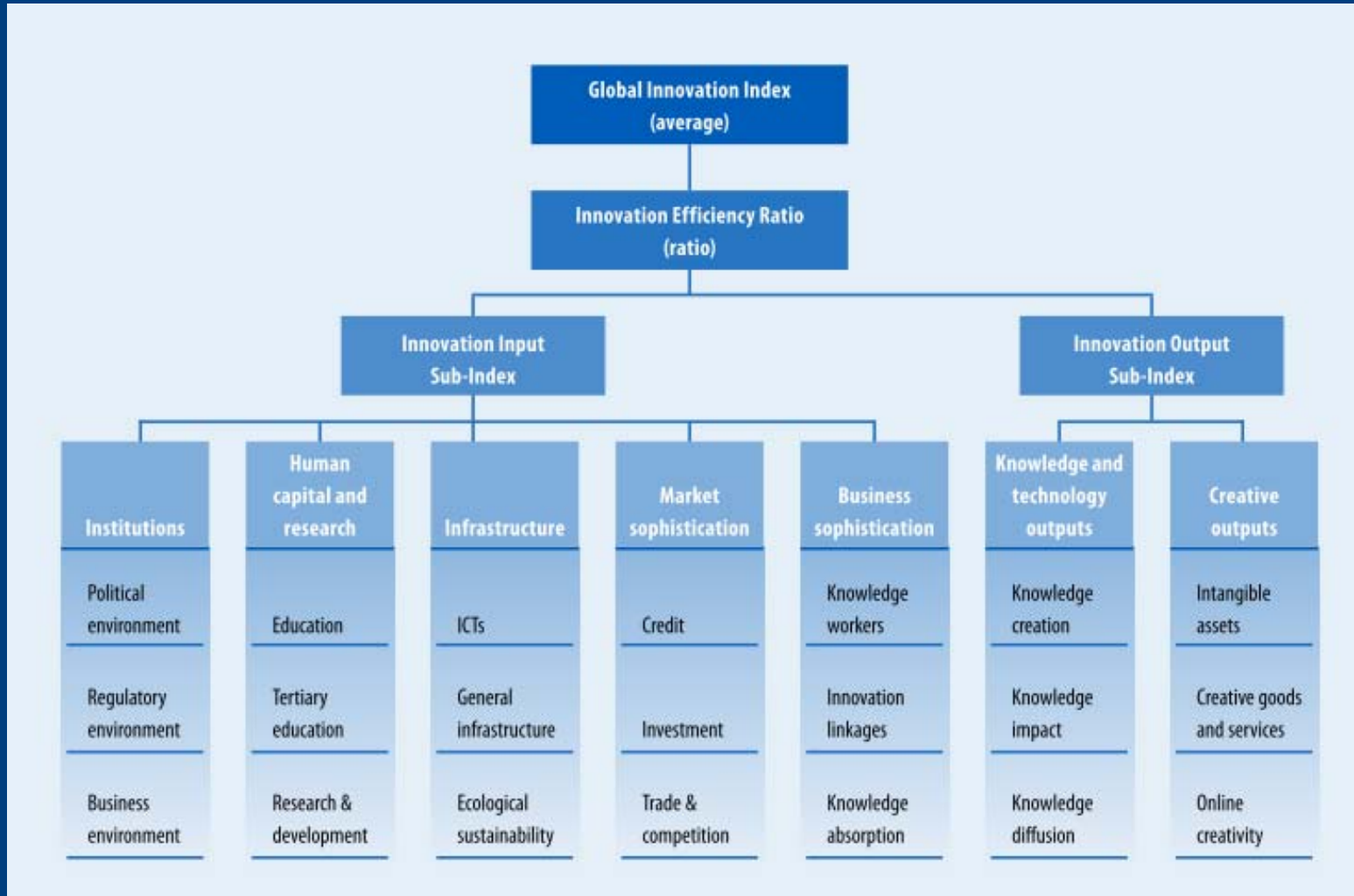
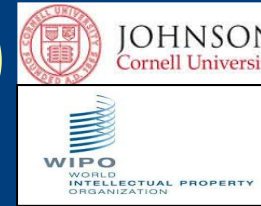
Global Innovation Index (GII)	UNDP Human Development Index (HDI)
Global Competitiveness Index	Legatum Prosperity Index
IMD's World Competitiveness Scoreboard	OECD Better Life Index
ITIF Global Innovation Policy Index	Ease of Doing Business Index
Environmental Performance Index	Economic Freedom Index
Energy Sustainability Index	Corruption Perception Index
World's Most Livable Cities	WEF Travel and Tourism Competitiveness Index
Mercer's Quality of Living and Quality of Infrastructure Ranking	



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Global Innovation Index (GII)

81 metrics; 143 countries



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Some detail on the GII

Aim

- Measuring innovation across 143 economies

Objectives

- A 'tool for action' for decision makers with the goal of improving countries' innovation performance

Method

- 2 sub-indices; 7 pillars; 21 sub-pillars; 81 metrics
- mostly hard data (56)
- simple average of averages

More detail on the GII

- Recognises the key role of innovation as a driver of economic growth and well-being
- Beyond one-dimensional innovation metrics - a more holistic analysis of innovation drivers and outcomes
- Applicable to developed and emerging economies alike

Global Innovation Index – Top 10

stability at the top

2014

2011	2012	2013
1. Switzerland	1. Switzerland	1. Switzerland
2. Sweden	2. Sweden	2. Sweden
3. Singapore	3. Singapore	3. UK
4. Hong Kong	4. Finland	4. Netherlands
5. Finland	5. UK	5. USA
6. Denmark	6. Netherlands	6. Finland
7. USA	7. Denmark	7. Hong Kong
8. Canada	8. Hong Kong	8. Singapore
9. Netherlands	9. Ireland	9. Denmark
10. UK	10. USA	10. Ireland

1. Switzerland
2. UK
3. Sweden
4. Finland
5. Netherlands
6. USA
7. Singapore
8. Denmark
9. Luxembourg
10. Hong Kong



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GII Innovation Input Sub-Index

measuring the innovation eco-system

...considers the elements of an economy that enable innovative activity through five pillars:

- Institutions
- Human capital and research
- Infrastructure
- Market sophistication
- Business sophistication

GII Innovation Output Sub-Index

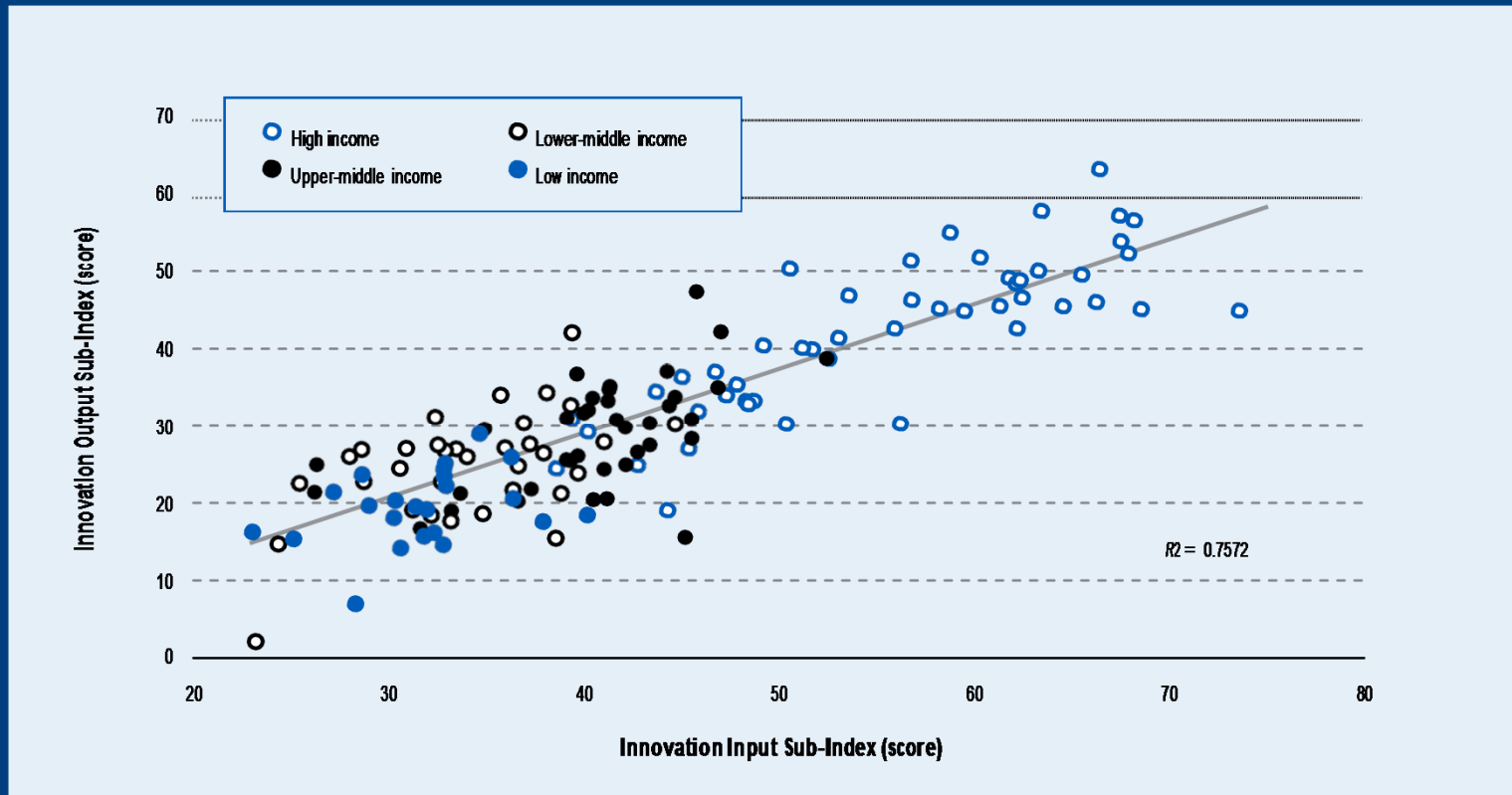
measuring innovation outputs

...variables provide information on elements that are the result of innovation within an economy.

It has two pillars:

- Knowledge and technology outputs
- Creative outputs

GII Innovation Output Sub-Index vs. Innovation Input Sub-Index



Although scores on the Input and Output Sub-Indices might differ substantially, leading to important shifts in rankings from one sub-index to the other for particular countries, the data confirm that efforts made to improve enabling environments are rewarded with increased innovation outputs.

Doing more with less

The Innovation Efficiency Ratio

- The Innovation Efficiency Ratio is calculated as the ratio of the Output Sub-Index over the Input Sub-Index.
- The efficiency ratio is designed to be independent from countries' stages of development
- The 10 countries with the highest Innovation Efficiency Ratios are countries that are particularly good at surmounting relative weaknesses in their Input sub-indices with relatively robust output results.



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The top 10 in the Innovation Efficiency Ratio

Ranking	Country	GII ranking
1	Moldova	43
2	China	29
3	Malta	25
4	Indonesia	87
5	Vietnam	71
6	Switzerland	1
7	Venezuela	122
8	Nigeria	110
9	Luxembourg	9
10	Ivory Coast	116

The key to using the GII

Identifying the underlying conditions of a country and comparing performances among peers is the key to a good understanding of the implications of a country's ranking on the GII.



Top 3 countries in each income group (GII index overview)

Metric \ Country	High-income economies			Upper-middle-income economies			Lower-middle-income economies			Low-income economies		
	Switzerland	UK	Sweden	China	Malaysia	Hungary	Moldova	Mon-golia	Ukraine	Kenya	Uganda	Rwanda
GII 2014 (out of 143)	1	2	3	29	33	35	43	56	63	85	91	102
Innovation Input Sub-Index (ISI).	7	3	6	45	30	41	80	51	88	103	98	74
Innovation Output Sub-Index (OSI).	1	4	3	16	35	29	30	67	46	73	90	128
Innovation Efficiency Ratio. OSI/ISI.	6	29	22	2	72	15	1	94	14	26	77	137

Note:

Coloured cells correspond to rankings

Top 25	26 – 50	51 – 75	76 – 100	101 – 125	> 126
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Top 3 countries in each income group for GII

Metric \ Country	High-income economies			Upper-middle-income economies			Lower-middle-income economies			Low-income economies		
	Switzerland	UK	Sweden	China	Malaysia	Hungary	Moldova	Mon-golia	Ukraine	Kenya	Uganda	Rwanda
GII 2014 (out of 143)	1	2	3	29	33	35	43	56	63	85	91	102
Innovation Input Sub-Indices	7	3	6	45	30	41	80	51	88	103	98	74
1 Institutions	16	13	10	114	50	40	80	63	103	97	86	70
2 Human capital & research	12	10	6	32	35	42	71	79	45	117	114	102
3 Infrastructure	10	6	4	39	35	36	88	48	107	127	102	120
4 Market sophistication	6	2	9	54	17	115	49	33	90	40	102	27
5 Business sophistication	8	14	9	32	29	45	102	51	87	91	48	44
Innovation Output Sub-Indices	1	4	3	16	35	29	30	67	46	73	90	128
6 Knowledge & technology outputs	1	5	3	2	39	24	26	89	32	70	87	126
7 Creative outputs	2	7	9	59	39	35	32	54	77	73	90	117
Innovation Efficiency Ratio	6	29	22	2	72	15	1	94	14	26	77	137

Note:

Coloured cells correspond to rankings: Top 25 (green), 26 – 50 (teal), 51 – 75 (yellow), 76 – 100 (orange), 101 – 125 (light orange), > 126 (red)



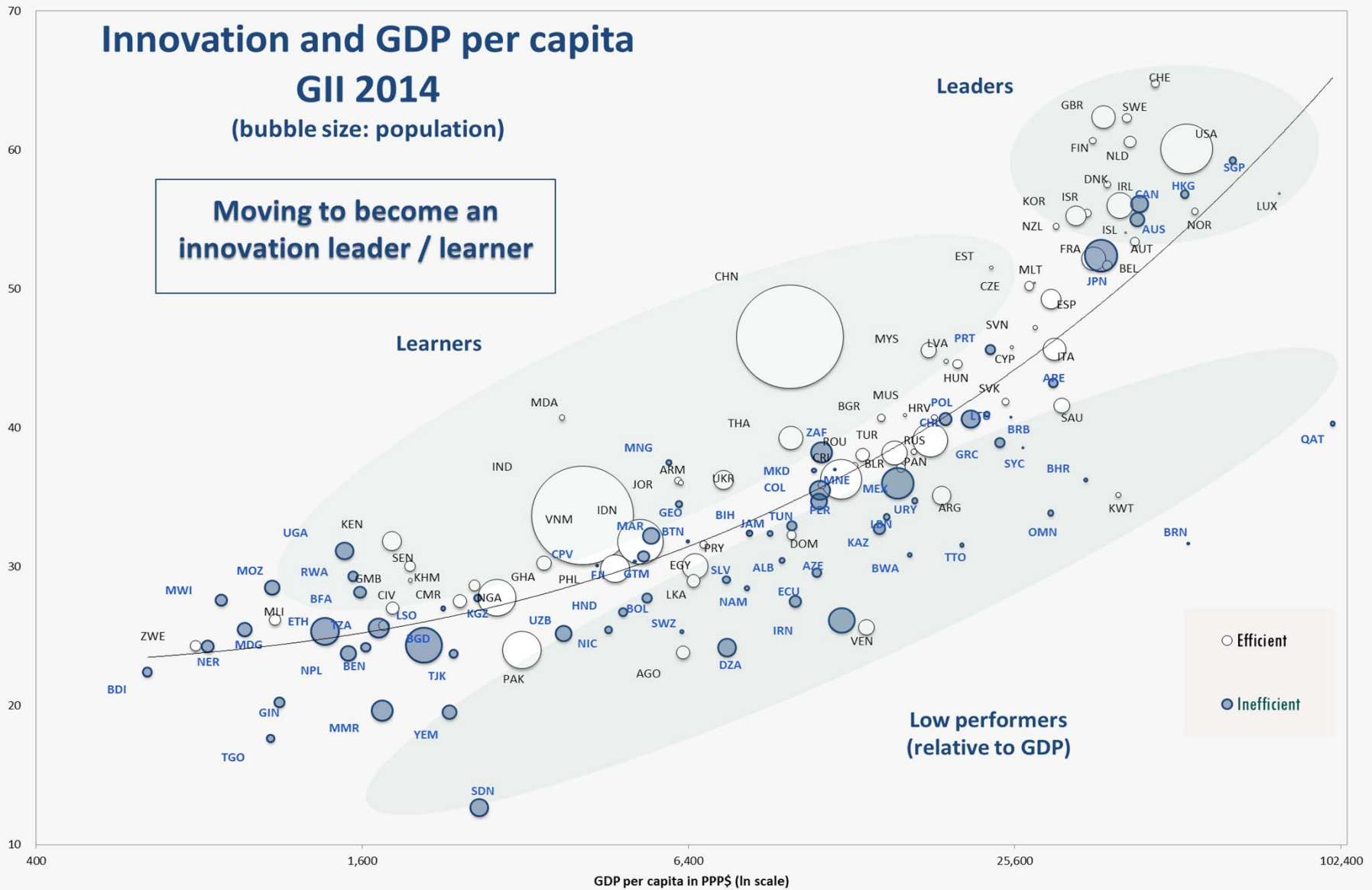
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Innovation and GDP per capita

GII 2014

(bubble size: population)

Moving to become an innovation leader / learner



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GII heatmap for regional and income group averages (1-100)



Sub-Saharan Africa:

A region of innovation learners

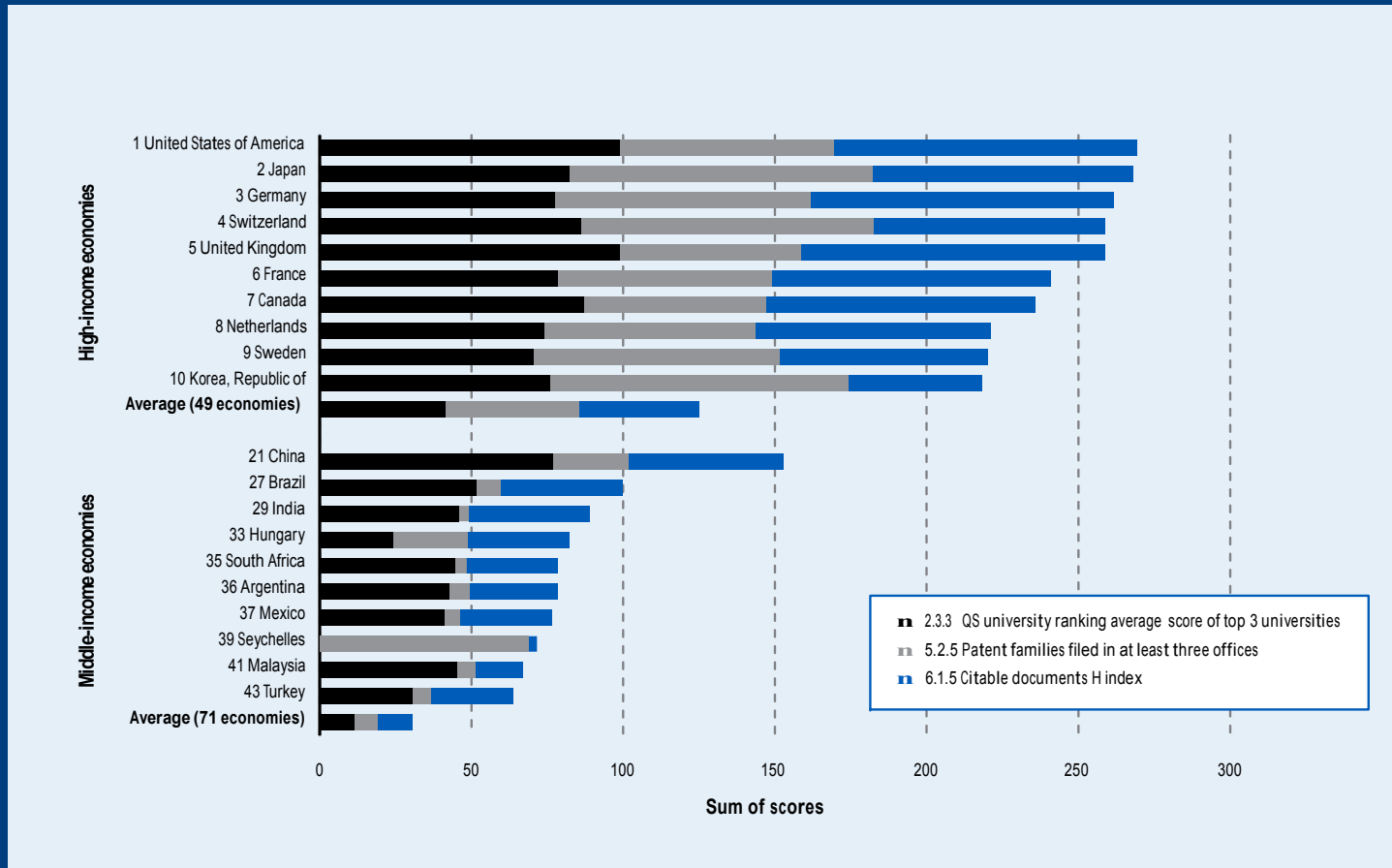
Sub-Saharan Africa is the region that sees the most significant improvement in GII rankings in 2014.

The relative performance advantage of some of these nations is significant. Examples include:

- Mauritius' high score in Institutions
- South Africa's high score in Market sophistication
- Gambia's performance in Knowledge and technology outputs
- Seychelles' score in Creative outputs

New metrics can be created from GII components

e.g. a metrics for quality of innovation: top 10 high and middle-income economies



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Innovation in the context of climate change

- Climate change is a global problem
- Until energy from non-fossil fuels (esp. electricity) is priced equally with fossil fuels, we are unlikely to make an impact on climate change

Said more elegantly by the Centre for Clean Energy Innovation:

“At its core, climate change is a fungible technology problem. Cost is king. As a result, the key to the global adoption of low-carbon energy is making it a cheaper alternative than fossil fuels.

As a result, the dominant climate advocacy efforts to-date – such as making dirty energy more expensive or capping carbon emissions – are inherently limited by economic concerns, which inhibit carbon reductions.

Therefore, the defining principle of climate policy is making clean tech cheaper. In other words, innovation.”



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What's needed? Pre-emptive approach

- Breakthrough innovations in energy, grid & storage technology, especially innovation in storage technologies.
- Adoption of such innovations appropriate to a nation or region, *noting each nation needs to analyse its energy needs & opportunities and adjust accordingly.*

What's needed? Defensive approach

Breakthrough innovations in learning about & addressing the effects of climate change

Examples from my region:

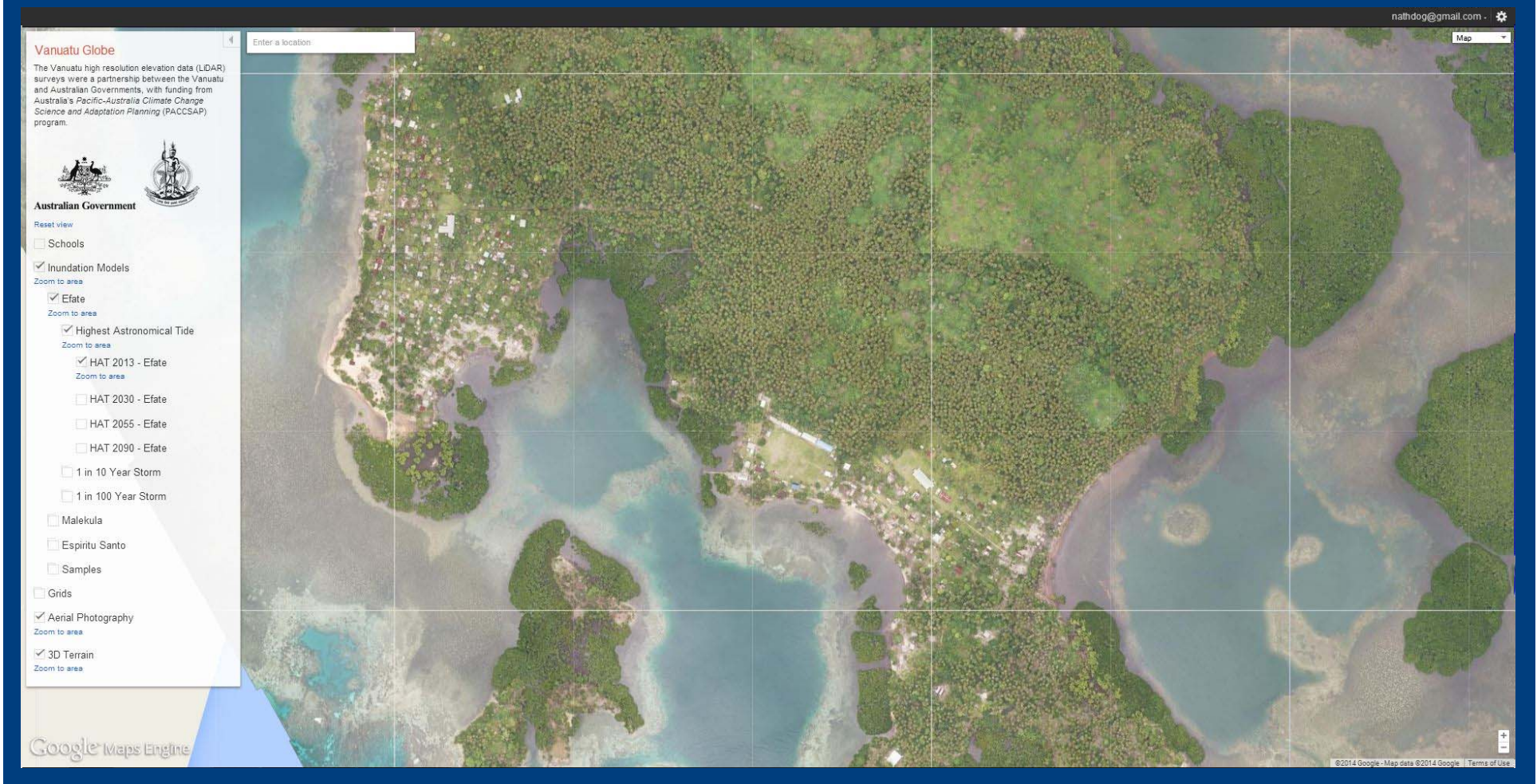
- *South Pacific nations using climate change to estimate sea-level rise impacts*
- *New Zealand Antarctic Research Institute to leverage global studies of Antarctica & the Southern Ocean to understand likely climate change impact on NZ South Island economy.*



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Maskelyne Islands, Vanuatu in 2030

Government can plan for “at-risk” communities



New Zealand Antarctic Research Institute

NZARI partners with research agencies around the world to develop a global understanding of Antarctica's impacts and vulnerability in a changing global climate.



What happens in the circumpolar current - the transition between Antarctica and the great oceans - will arguably be the most graphic manifestation of climate change. It will affect every coastal settlement in the world.

Funding for NZARI is sought from organisations concerned with global-scale connections to Antarctica and consequences of its changing environment.

NZARI is a charitable trust.



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So in the light of climate change,
do all nations need to innovate?

Yes, the energy adjustments that
seem to be needed could have very
major economic and social impacts
(+ve & -ve).

Highly innovative countries will be in
a more robust position.



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Do we need a climate change innovation index?

It would be a useful adjunct to innovation indices.

Could draw on innovation indices & energy indices.



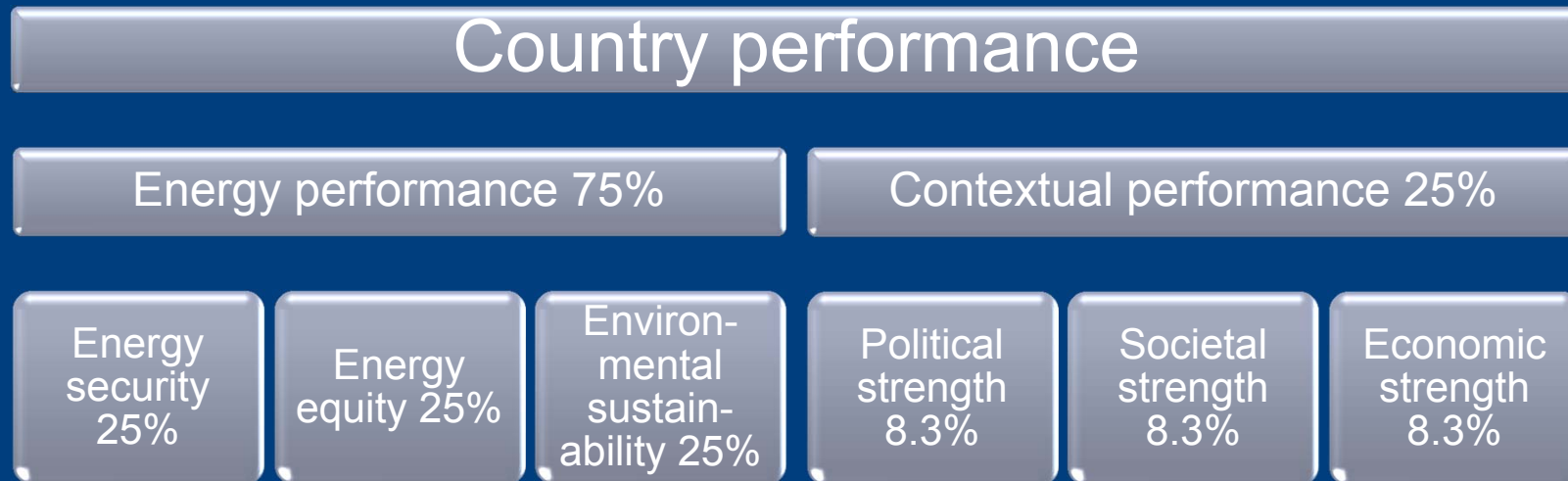
Energy Sustainability Index

Ranks countries in terms of their likely ability to provide sustainable energy policies through the **3 dimensions** of the energy trilemma:

- **Energy security**: the effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of participating energy companies to meet current and future demand.
- **Energy equity**: the accessibility and affordability of energy supply across the population.
- **Environmental sustainability**: the achievement of supply and demand-side energy efficiencies and the development of energy supply from renewable and other low-carbon sources.

Countries are also awarded a '**balance score**'. While the Index rank measures overall performance, the balance score highlights how well a country manages the trade-offs between the three competing dimensions: energy security, energy equity, and environmental-sustainability.

Energy Sustainability Index methodology



- 23 indicators are used
- more than 60 data sets are used to develop 23 indicators
- weighted in favour of the energy performance axis by a factor of 3:1

Energy Sustainability Index 2013

RANK	Energy Sustainability Index	Balance Score
1	Switzerland	AAA
2	Denmark	AAA
3	Sweden	AAA
4	Austria	AAB
5	United Kingdom	AAA
6	Canada	AAB
7	Norway	AAB
8	New Zealand	AAB
9	Spain	AAA
10	France	AAB
11	Germany	AAB
12	Netherlands	AAB
13	Finland	AAB
14	Australia	AAD
15	United States	AAC
16	Japan	ABB
17	Belgium	ABB
18	Qatar	AAC
19	Luxembourg	ABD
20	Ireland	ABC
21	Costa Rica	ABB
22	Slovakia	ABB
23	Portugal	ABB
24	Colombia	AAC
25	Slovenia	BBB



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Any climate change innovation index would need to reflect:

- climate change & innovation ecosystems

and

- climate change & innovation outputs

End



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Top 3 countries in each income group (GCI index)

Metric \ Country	High-income economies			Upper-middle-income economies			Lower-middle-income economies			Low-income economies		
	Switzerland	UK	Sweden	China	Malaysia	Hungary	Moldova	Mon-golia	Ukraine	Kenya	Uganda	Rwanda
GCI 2014 – 2015 (out of 144)	1	9	10	28	20	60	82	98	76	90	122	62
Basic requirements (20.0%)	4	24	12	28	23	60	90	105	87	115	126	67
1. Institutions	9	12	13	47	20	83	121	98	130	78	115	18
2. Infrastructure	5	10	22	46	25	50	83	112	68	96	129	105
3. Macroeconomic environment	12	107	17	10	44	61	56	125	105	126	96	79
4. Health and primary education	11	21	23	46	33	64	93	65	43	120	122	86
Efficiency enhancers (50.0%)	5	4	12	30	24	53	88	92	67	66	110	91
5. Higher education and training	4	19	14	65	46	52	84	68	40	95	129	122
6. Goods market efficiency	8	13	17	56	7	65	103	81	112	62	119	42
7. Labour market efficiency	1	5	20	37	19	75	82	42	80	25	27	9
8. Financial market development	11	15	12	54	4	73	100	124	107	24	81	55
9. Technological readiness	10	2	3	83	60	50	51	81	85	87	119	98
10. Market size	39	6	36	2	26	53	124	120	38	74	86	125
Innovation and sophistication factors (30.0%)	1	8	7	33	17	67	129	112	92	40	104	66
11. Business sophistication	2	6	8	43	15	92	124	115	99	44	109	84
12. Innovation	2	12	7	32	21	50	131	106	81	38	96	53