ITU Asia-Pacific Centre of Excellence Workshop

Implementing e-application strategy for telecom sector in the Pacific

ICT Status, Connectivity, Benchmarks and Pacific

DEPARTMENT OF COMMUNICATION

Australian Government

Department of Communications and the Arts

CELEBRATING 25 YEARS OF ACHIEVEMENTS

Goals for a Sustainable Future : The SDGs

17 Sustainable Development Goals
and
169 Targets


Emergency


Education


Health


Agriculture

Governance

Investment

Applications

Policy & Regulation

Capacity Building


Transport


IoT, Sensor Networks


Universal Broadband


Green ICT & E-Waste

Measurements


Electricity

Privacy & Security


Infrastructure Security


Water

Digital Inclusion


Spectrum Management


Standards, Conformity & Interoperability


Finance

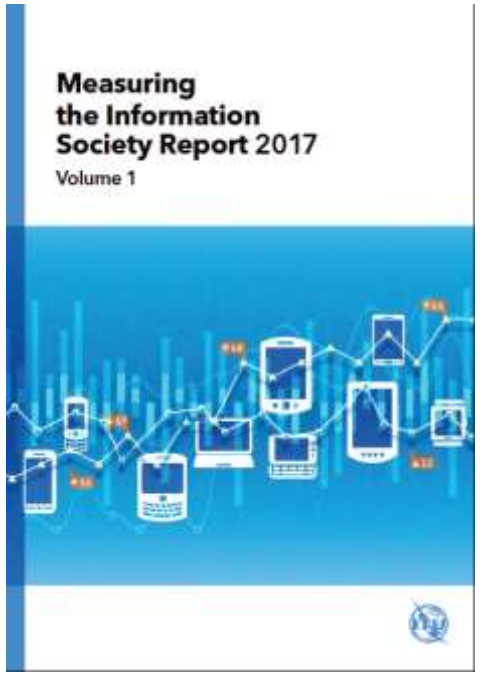
SMART SOCIETY

ICTs are cross-sectoral and needs an ecosystem approach

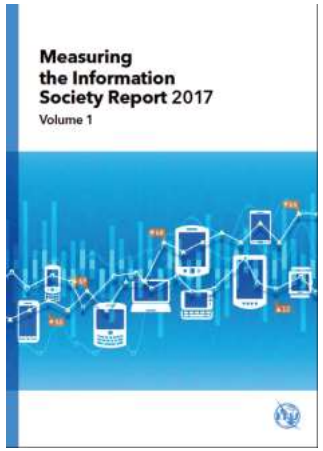
SEVEN MAJOR TRENDS MOVING ICT MARKETS

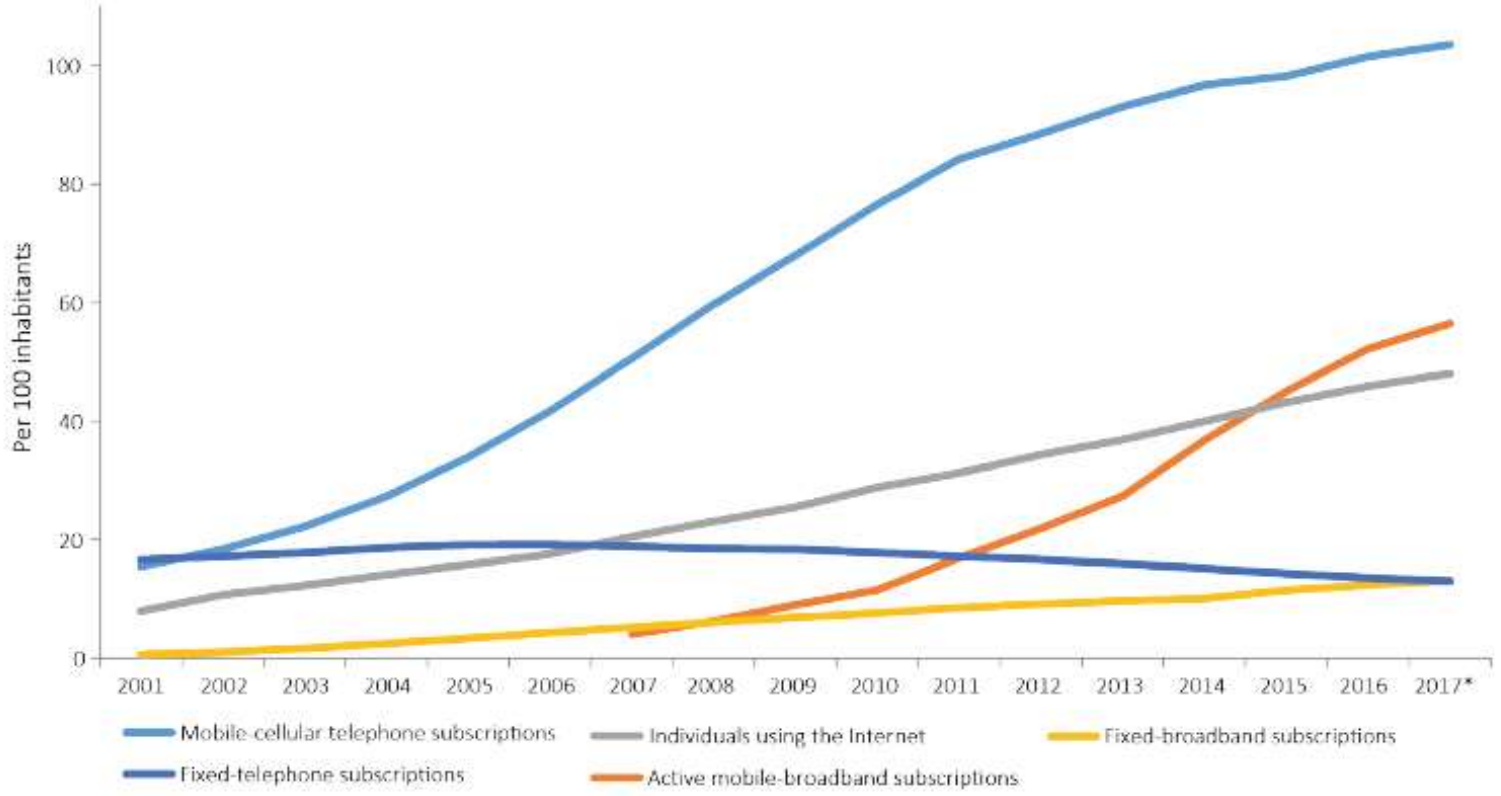
1. ICTs move centre-stage as the digital economy gains momentum.
2. Mobile – the engine for expanded local access to the Internet
3. ICTs are less visible but more prevalent.
4. ICTs are enabling and disrupting industries.
5. The rise of the app economy.
6. Market concentration and consolidation.
7. Cyber threats have grown in scope and scale.

Source: ITU



Measuring ICT



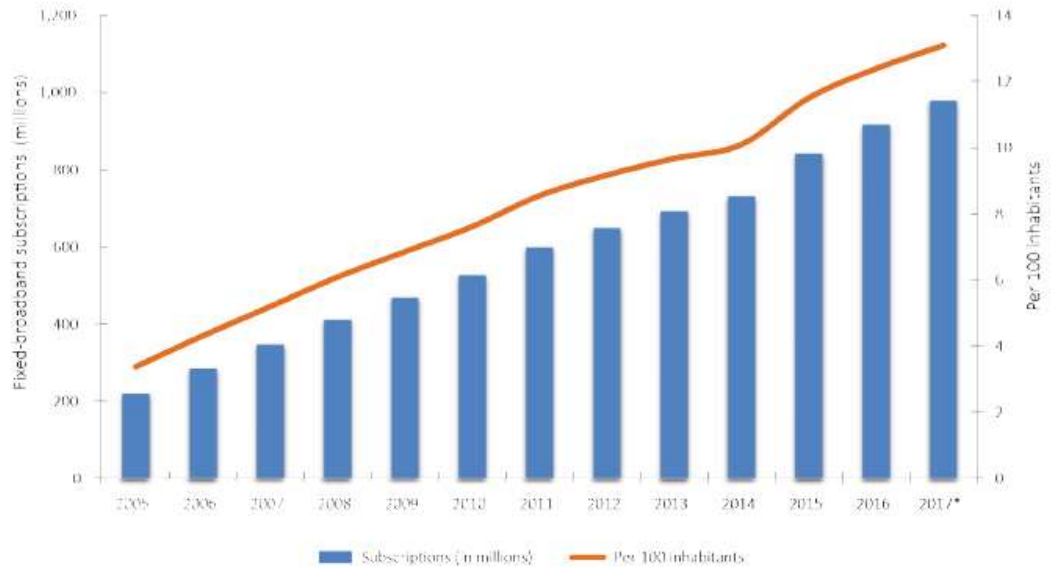


Notes: * ITU estimate.
Source: ITU.

Available for download at http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx

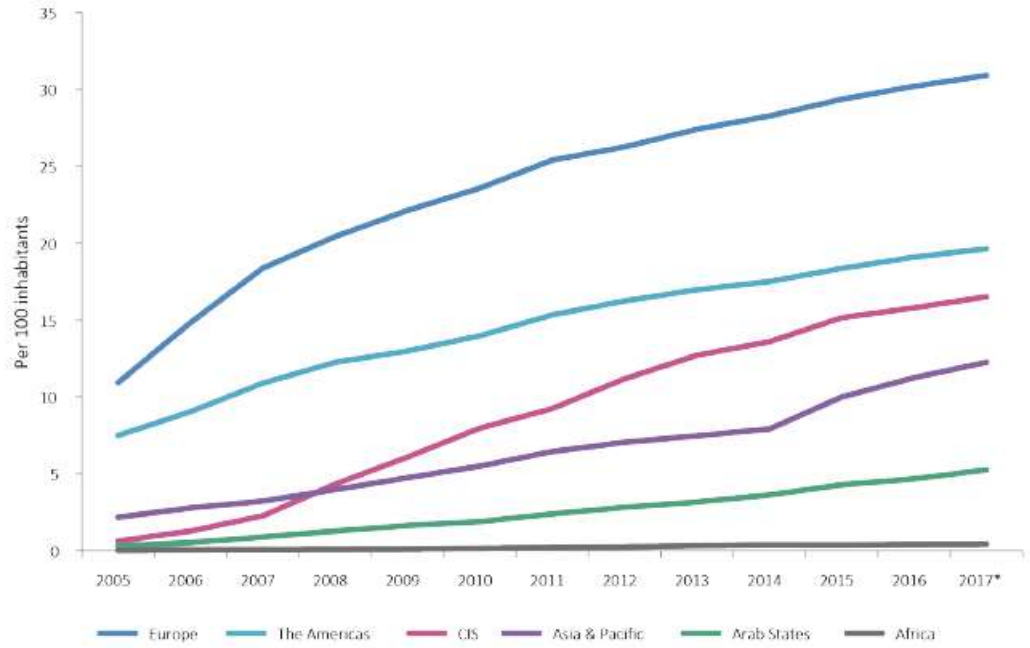
Fixed broadband networks

Chart 1.14: Global fixed-broadband subscriptions, total and per 100 inhabitants, 2005–2017*



Notes: * ITU estimate.
Source: ITU.

Chart 1.16: Fixed-broadband subscriptions per 100 inhabitants by region, 2005–2017*

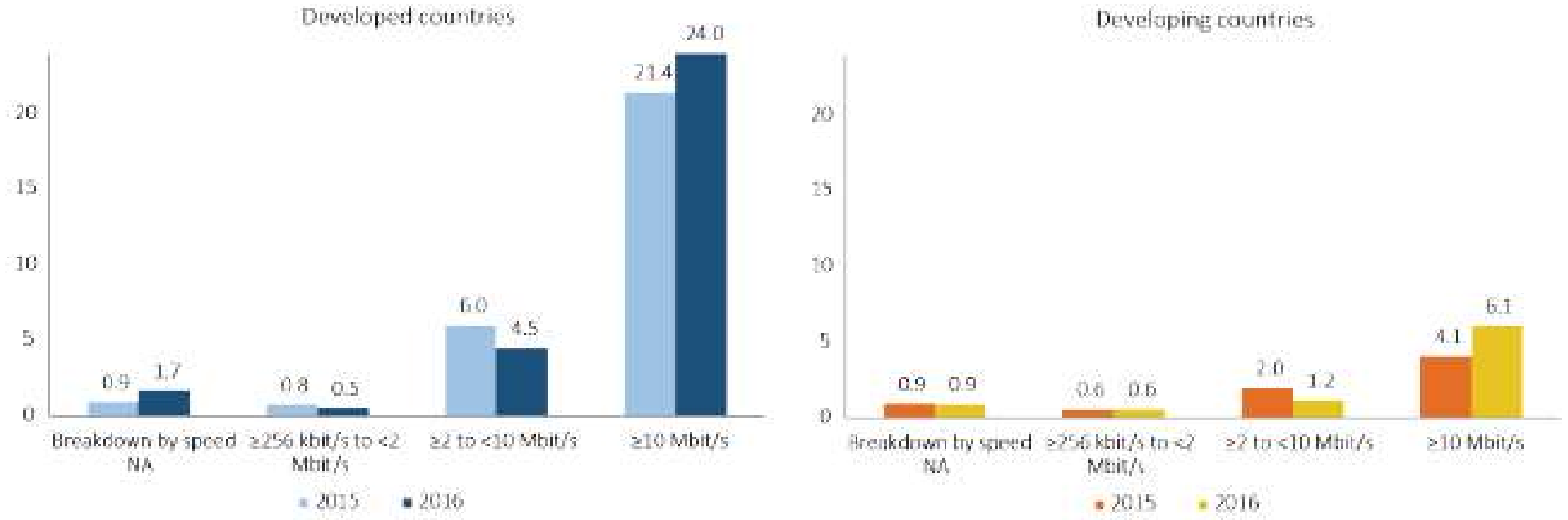


Notes: * ITU estimate.
Source: ITU.

Worldwide, the number of fixed-broadband subscriptions has risen from 220 million in 2005 to 526 million in 2010, 842 million in 2015 to an estimated 979 million in 2017

Fixed broadband networks

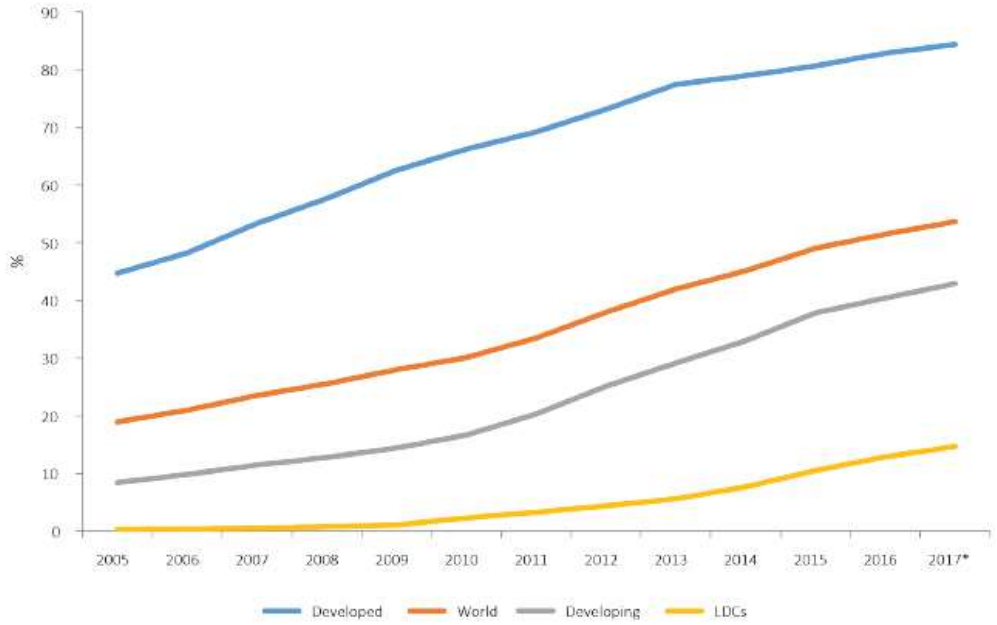
Chart 1.17: Fixed-broadband subscriptions per 100 inhabitants, by speed, 2015-2016



Source: ITU.

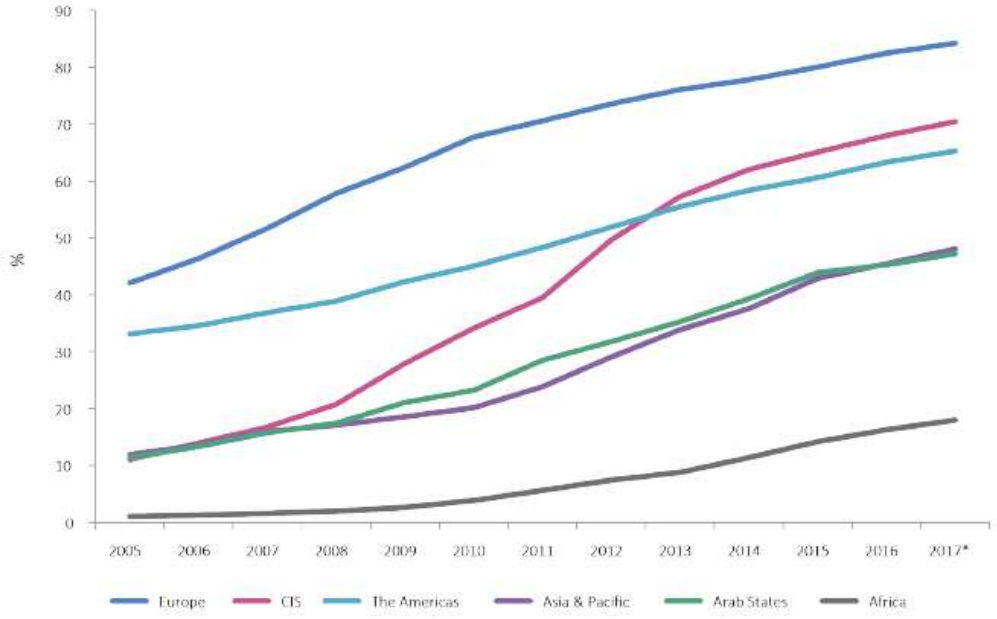
Households with access to Internet

Chart 1.18: Global proportion of households with access to the Internet, 2005–2017*



Notes: * ITU estimate.
Source: ITU.

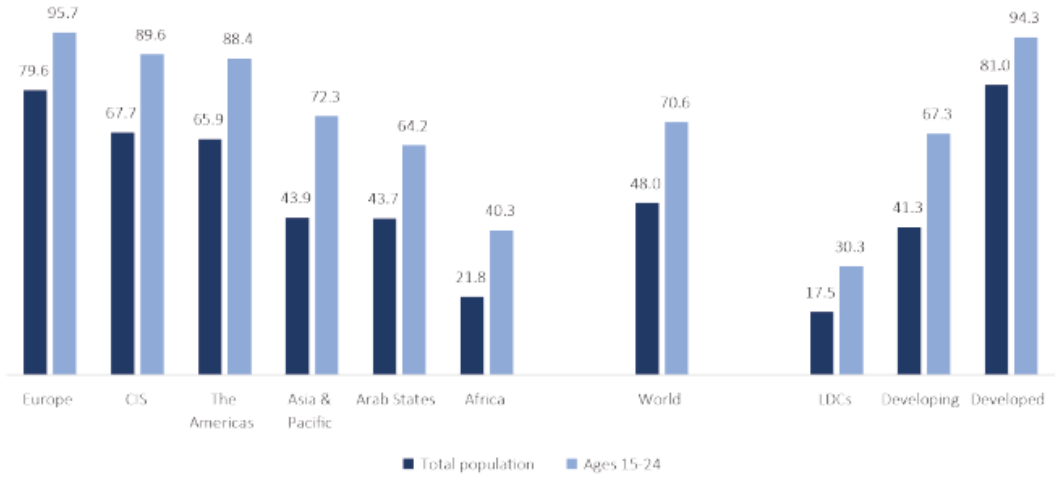
Chart 1.19: Proportion of households with access to the Internet by region, 2005–2017*



Notes: * ITU estimate.
Source: ITU.

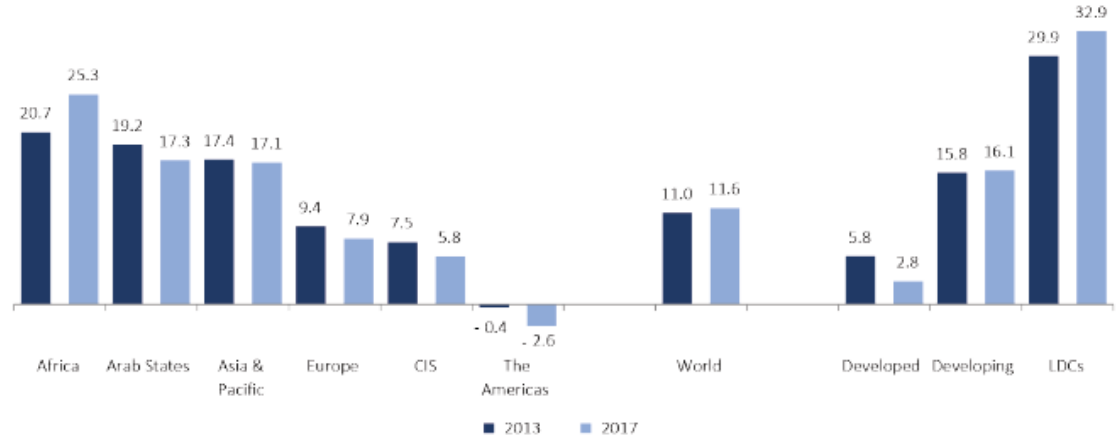
Households with access to Internet

Chart 1.25: Proportion of individuals using the Internet, by age, 2017*



Notes: * Estimates. Proportions in this chart refer to the number of people using the Internet, as a percentage of the total population, and the number of people aged 15-24 using the Internet, as a percentage of the total population aged 15-24, respectively.
Source: ITU.

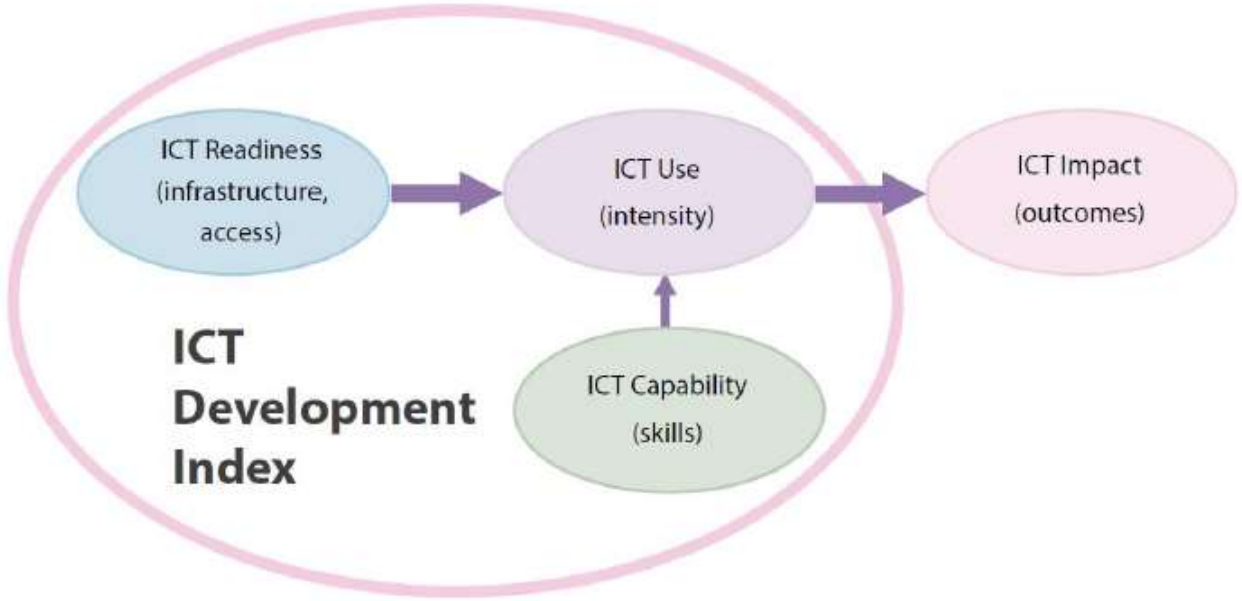
Chart 1.24: Internet user gender gap, percentages, 2013 and 2017*



Notes: * Estimates. The gender gap represents the difference between the Internet user penetration rates for males and females relative to the Internet user penetration rate for males, expressed as a percentage.
Source: ITU.

What is ICT Development Index?

Figure 2.1: Three stages in the evolution towards an information society



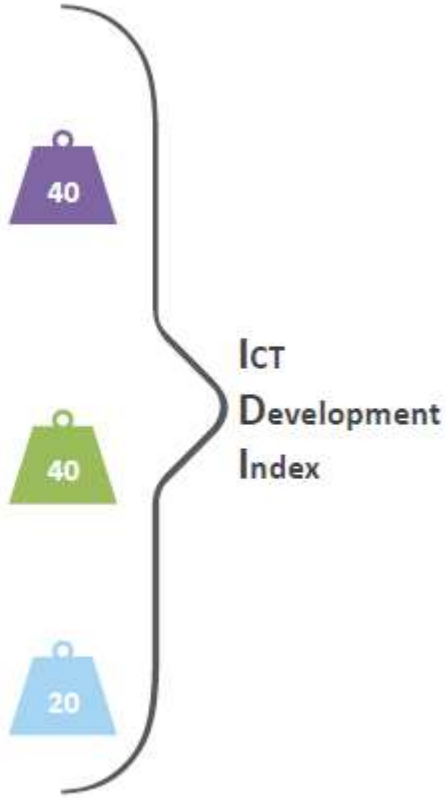
Source: ITU.

The main objectives of the IDI are to measure:

- the *level and evolution over time* of ICT developments within countries and of their experience relative to other countries;
- progress in ICT development *in both developed and developing countries*;
- the *digital divide*, i.e. differences between countries in terms of their levels of ICT development; and
- the *development potential* of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

What comprises IDI?

ICT access	Reference value	(%)
1. Fixed-telephone subscriptions per 100 inhabitants	60	20
2. Mobile-cellular telephone subscriptions per 100 inhabitants	120	20
3. International Internet bandwith (bit/s) per internet user	2'158'212*	20
4. Percentage of households with a computer	100	20
5. Percentage of households with Internet access	100	20
ICT use	**Reference value**	**(%)**
6. Percentage of individuals using the Internet	100	33
7. Fixed-broadband subscriptions per 100 inhabitants	60	33
8. Active mobile-broadband subscriptions per 100 inhabitants	100	33
ICT skills	**Reference value**	**(%)**
9. Mean years of schooling	15	33
10. Secondary gross enrolment ratio	100	33
11. Tertiary gross enrolment ratio	100	33



Note: * This corresponds to a log value of 6.33, which was used in the normalization step.
Source: ITU.

The extraordinary meeting adopted a total of 14 indicators to be included in the IDI with effect from IDI 2018, compared with the present list of 11 indicators.

Two existing indicators will be dropped from the IDI (both of which are currently in its access sub-index):
- fixed-telephone subscriptions per 100 inhabitants; and
- mobile-cellular subscriptions per 100 inhabitants.

Five indicators will be added to the Index:
- percentage of population covered by mobile networks (at least 3G and at least long-term evolution (LTE/WiMax) (access sub-index);
- mobile-broadband Internet traffic per mobile-broadband subscription (use sub-index);
- fixed-broadband Internet traffic per fixed-broadband subscription (use sub-index);
- percentage of individuals who own a mobile phone (use sub-index);
- proportion of individuals with ICT skills (skills sub-index).

Most dynamic countries in IDI - 2017

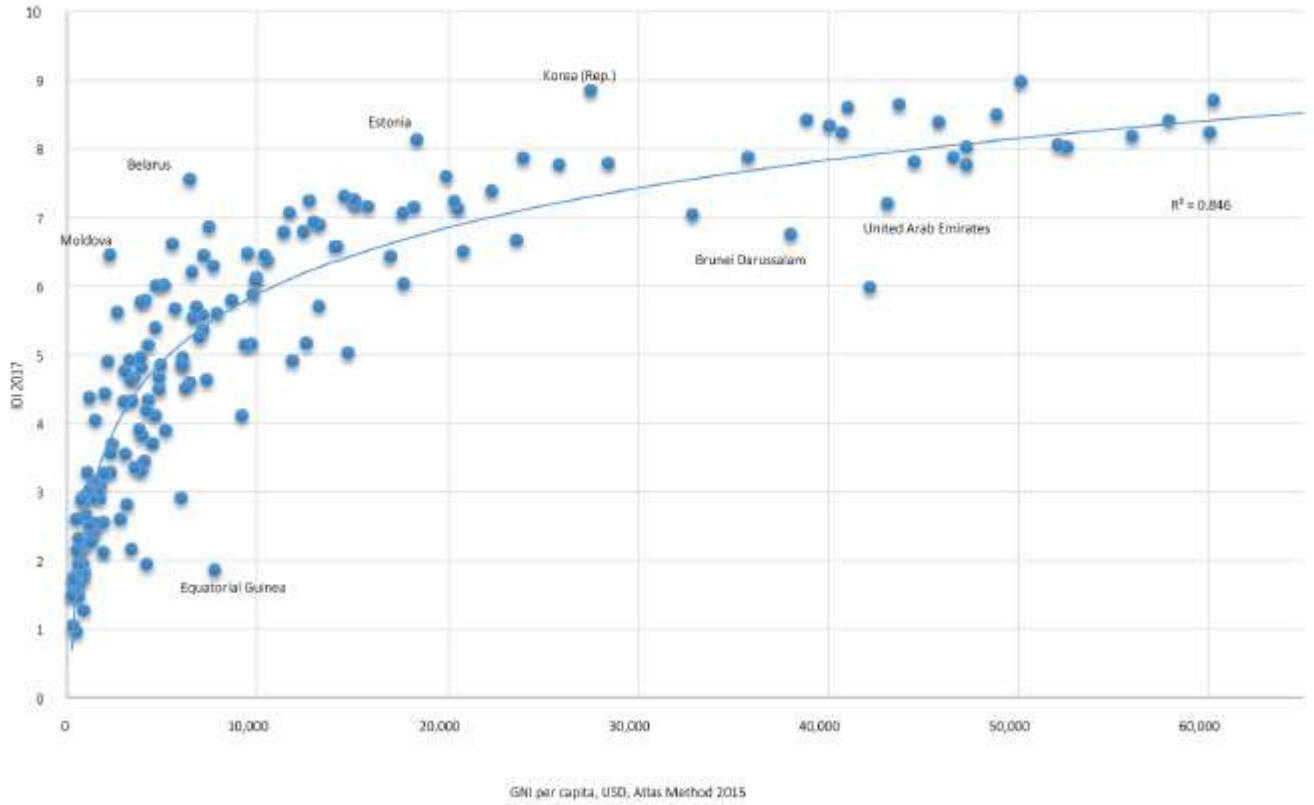
Table 2.6: Most dynamic countries in IDI rankings and values, 2016–2017

Change in IDI ranking			Change in IDI value (absolute)		
IDI rank 2017	Country	IDI rank change	IDI rank 2017	Country	IDI value change
95	Uzbekistan	8	118	Namibia	0.57
159	Afghanistan	6	81	Iran (I.R.)	0.54
36	Croatia	6	114	Gabon	0.50
88	Suriname	6	139	Lao P.D.R.	0.47
152	Uganda	6	28	Cyprus	0.47
42	Uruguay	6	111	Indonesia	0.47
139	Lao P.D.R.	5	112	Bolivia	0.47
35	Latvia	5	122	Timor-Leste	0.46
135	Myanmar	5	67	Turkey	0.43
118	Namibia	5	80	China	0.42
122	Timor-Leste	5	135	Myanmar	0.42
67	Turkey	5	95	Uzbekistan	0.42
			130	Nicaragua	0.42

Source: ITU

IDI and GNI per capita

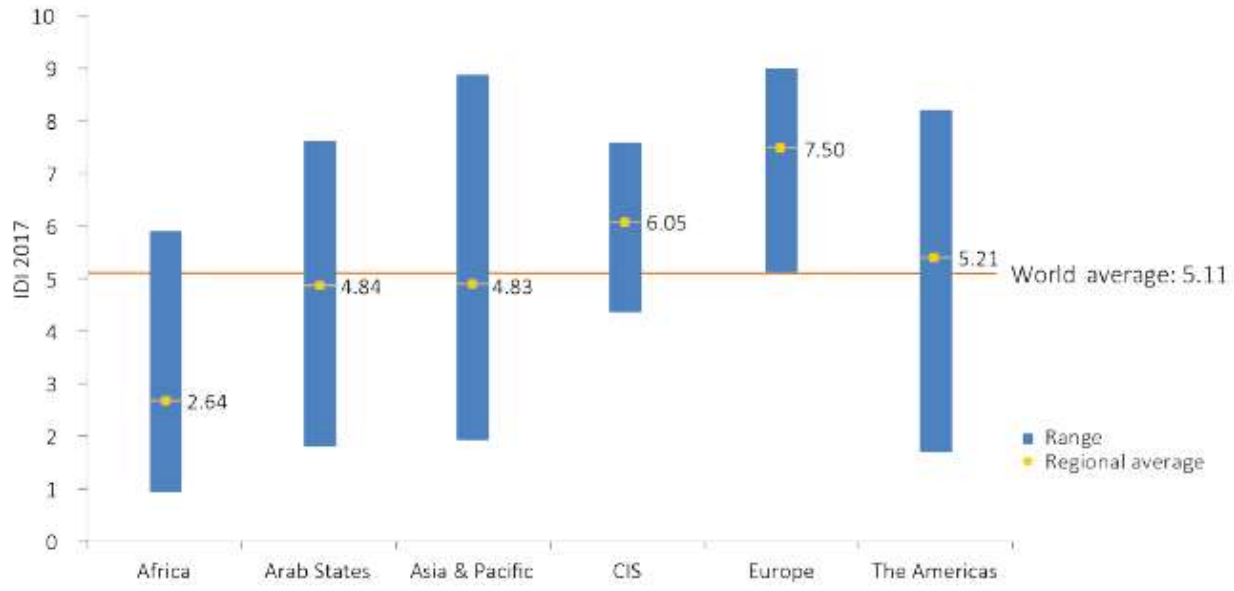
Chart 2.5: IDI and GNI per capita, 2017



Source: ITU.

Asia-Pacific has the greatest variation

Chart 3.1: IDI by region compared with global average, 2017

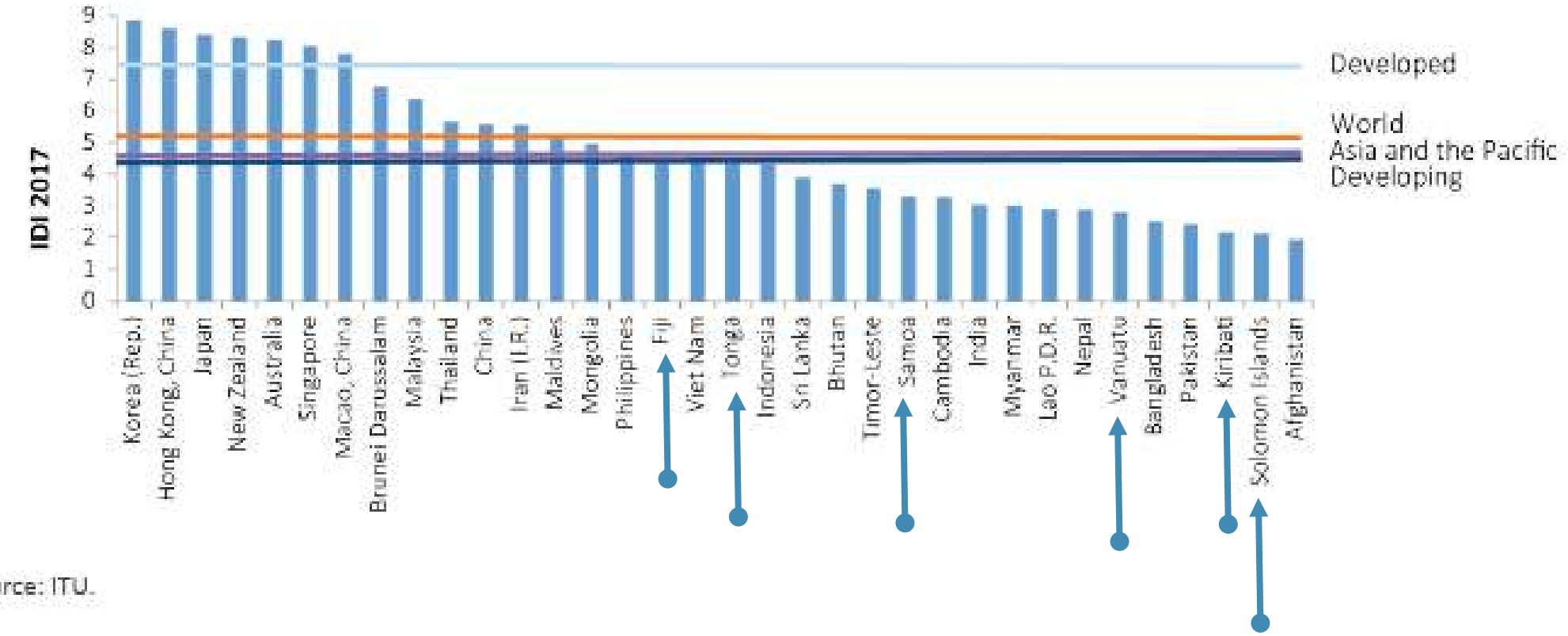


Source: ITU.

Asia and the Pacific			
1	Korea (Rep.)	8.85	2
2	Hong Kong, China	8.61	6
3	Japan	8.43	10
4	New Zealand	8.33	13
5	Australia	8.24	14
30	Bangladesh	2.53	147
31	Pakistan	2.42	148
32	Kiribati	2.17	154
33	Solomon Islands	2.11	157
34	Afghanistan	1.95	159

Asia-Pacific has the greatest variation

Chart 3.7: IDI values, Asia and the Pacific, IDI 2017



Source: ITU.

The most substantial average rate of improvement for any indicator in Asia and the Pacific was for mobile-broadband subscriptions. This indicator rose by an average 36.2 per cent between IDI 2016 and IDI 2017, with increases over 100 per cent, from very low baselines, in four countries (Samoa, Kiribati, the Lao P.D.R. and Afghanistan).

The second most substantial average rate of improvement (12.4 per cent) was for the proportion of households with Internet access, the highest improvements for which came from three LDCs (Bangladesh, the Lao P.D.R. and the Solomon Islands). All but one country in the region (Mongolia) recorded an improvement in this indicator.

IDI Economy Card (Examples)

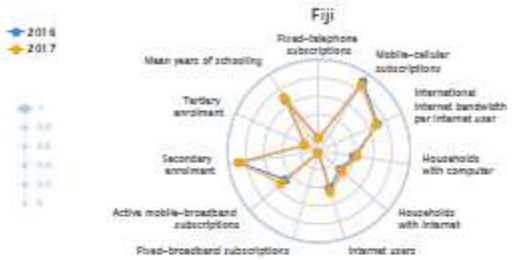
Fiji

Population: 898,130
Population density: 48.99
GNI per capita: 4,840
Region: Asia & Pacific, Developing

IDI 2017 Rank	IDI 2016 Rank
107	105

IDI 2017 Value	IDI 2016 Value
4.49	4.34

Regional IDI 2016 Rank: 16



IDI ACCESS SUB-INDEX

4.88

Fixed-telephone subscriptions per 100 inhabitants
8.26

Mobile-cellular telephone subscriptions per 100 inhabitants
103.30

International Internet bandwidth per Internet user (Bit/s)
23725.55

Percentage of households with computer
41.70

Percentage of households with Internet access
33.62

IDI USE SUB-INDEX

3.44

Percentage of individuals using the Internet
46.51

Fixed (wired)-broadband subscriptions per 100 inhabitants
1.37

Active mobile-broadband subscriptions per 100 inhabitants
54.34

IDI SKILLS SUB-INDEX

5.83

Mean years of schooling
10.50

Secondary gross enrolment ratio
88.67

Tertiary gross enrolment ratio
16.14

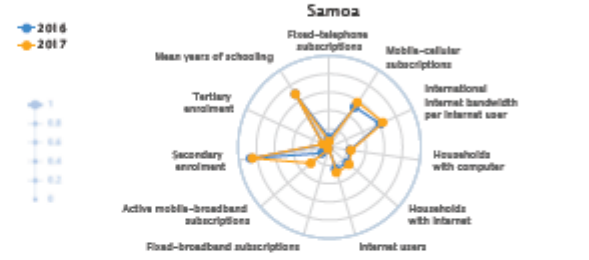
Samoa

Population: 194,552
Population density: 68.48
GNI per capita: 4,100
Region: Asia & Pacific, Developing

IDI 2017 Rank	IDI 2016 Rank
127	129

IDI 2017 Value	IDI 2016 Value
3.30	2.95

Regional IDI 2016 Rank: 23



IDI ACCESS SUB-INDEX

3.64

Fixed-telephone subscriptions per 100 inhabitants
3.70

Mobile-cellular telephone subscriptions per 100 inhabitants
69.19

International Internet bandwidth per Internet user (Bit/s)
13159.48

Percentage of households with computer
24.00

Percentage of households with Internet access
29.10

IDI USE SUB-INDEX

1.94

Percentage of individuals using the Internet
29.41

Fixed (wired)-broadband subscriptions per 100 inhabitants
1.23

Active mobile-broadband subscriptions per 100 inhabitants
26.62

IDI SKILLS SUB-INDEX

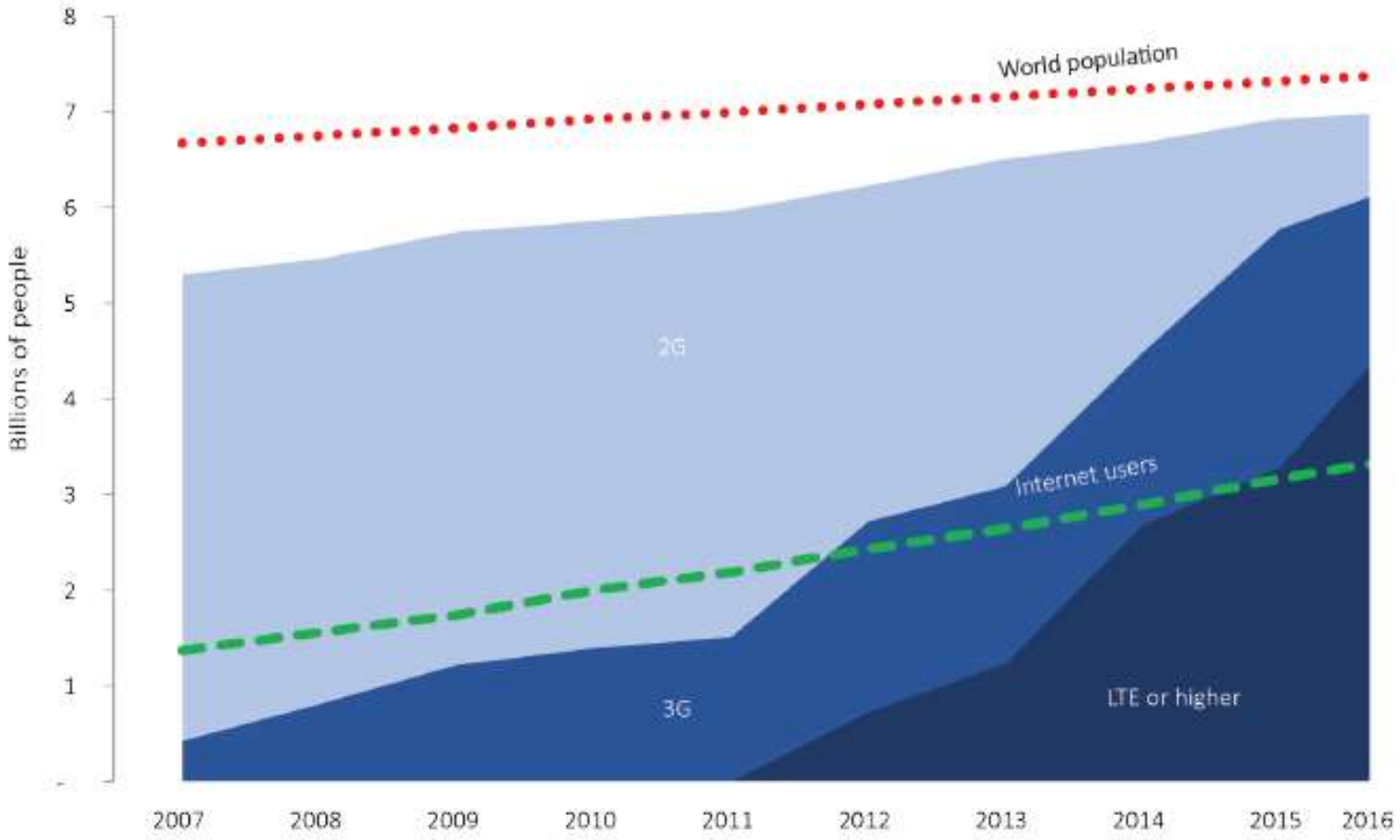
5.37

Mean years of schooling
10.30

Secondary gross enrolment ratio
84.96

Tertiary gross enrolment ratio
7.56

Coverage of mobile-cellular networks in relation to world population and the number of Internet users (2007-2016)

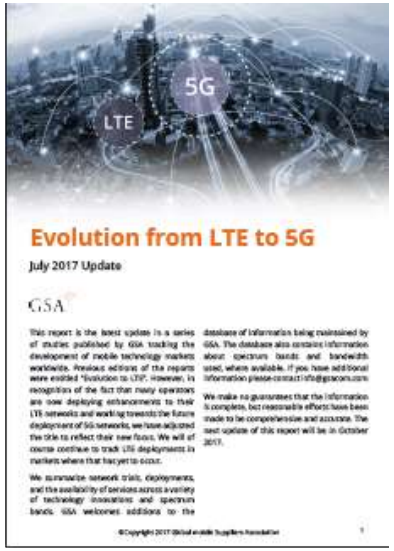


Source: ITU.

The number of subscriptions per 100 population has grown from 33.9 in 2005 to 76.6 in 2010, 98.2 in 2015 and an estimated 103.5 in 2017.

The number of subscriptions worldwide now exceeds the global population, with subscriptions also exceeding population in 112 of the 176 countries included in IDI 2017

LTE Network deployment Status



By the end of June 2017 GSA reports there were:

782 operators investing in LTE in 200 countries

601 commercially launched LTE or LTE-Advanced networks in **192** countries, including

98 LTE-TDD (TD-LTE) launched in **56** countries

109 commercial VoLTE networks in **57** countries, and 170 operators investing in VoLTE in **75** countries

197 launched networks are LTE-Advanced, in **96** countries

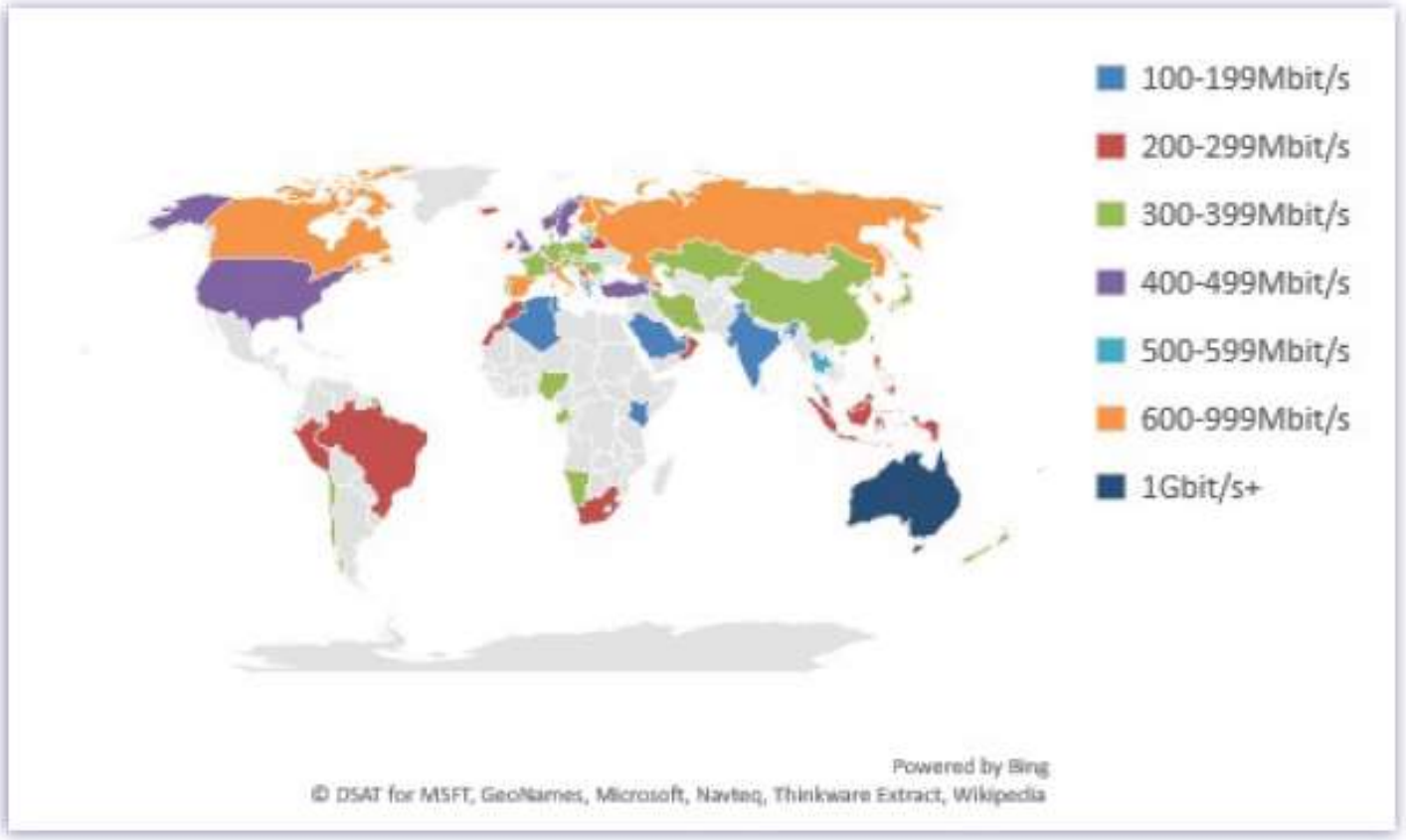
GSA forecasts c. **652** commercially launched LTE networks by end-2017

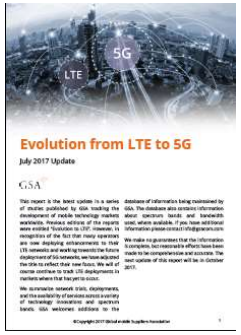
6 NB-IoT and **2** LTE-M/Cat-M1 networks are commercially launched, with **55** NB-IoT and **16** LTE-M/Cat-M1 networks planned or being trialled

22 operators, at least, have now made public commitments to deployment of pre-standards '5G' or standards-based 5G networks in **16** countries.

Report: Evolution from LTE to 5G, GSA

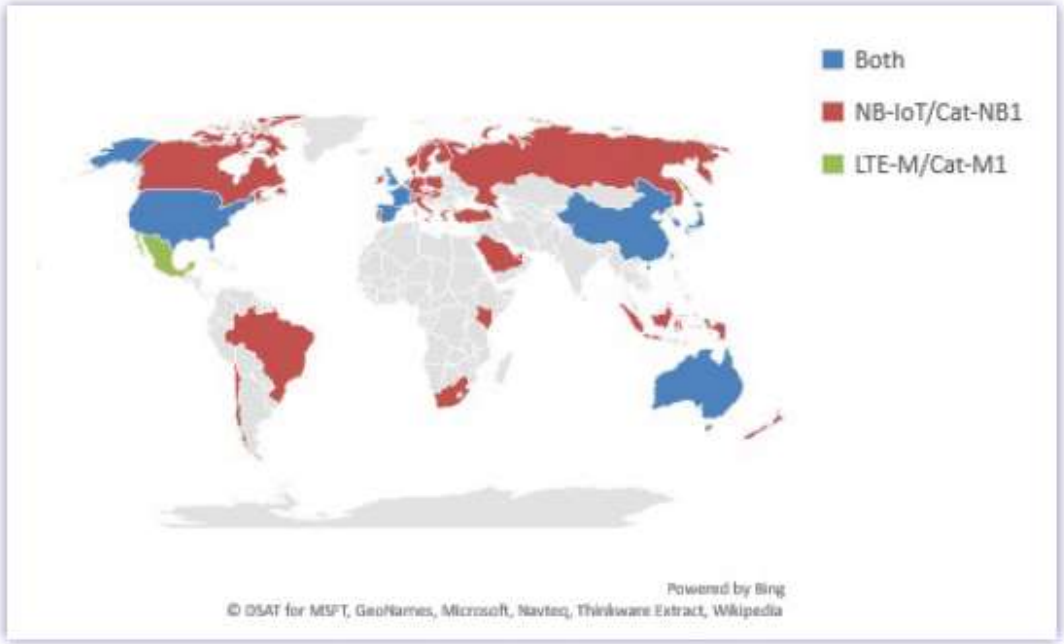
Speed of broadband mobile networks today - GSA





Report: Evolution from LTE to 5G GSA

NB-IOT mobile network deployments

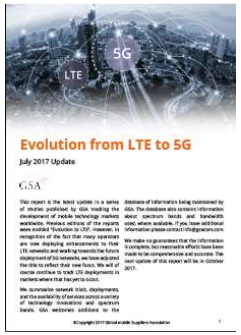


6 commercial NB-IoT networks (Telus Canada, T-Mobile Netherlands (nationwide since May 2017), Telia Norway, Vodafone Spain, Deutsche Telekom, and Vodacom South Africa).

A further **55 networks in 37 countries** trialling, demonstrating or planning to deploy NB-IoT/Cat-NB1 (18 of them with a stated commitment to launch during 2017).

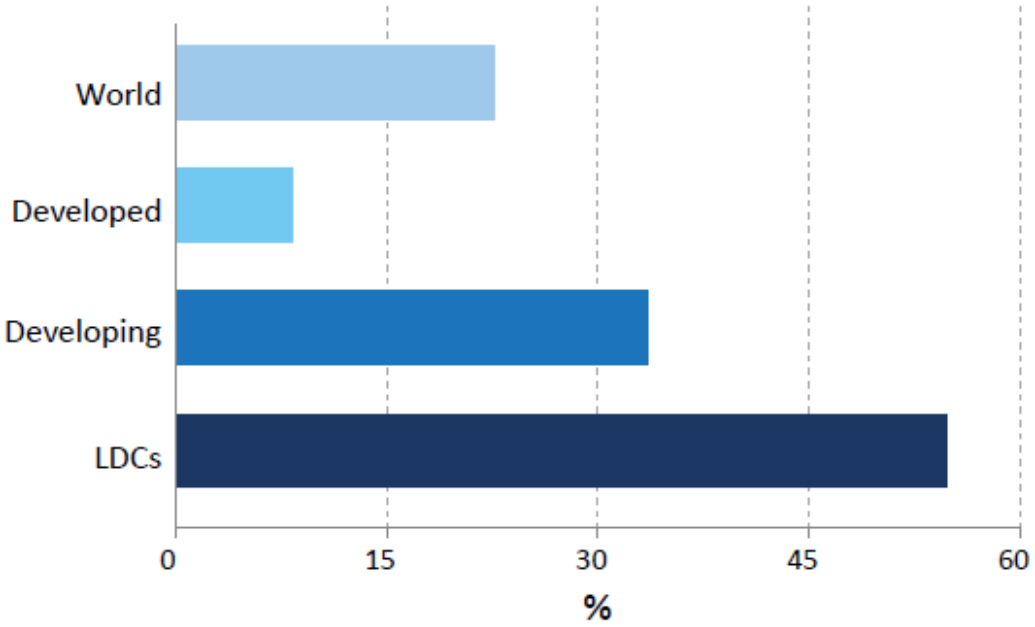
••**2 commercial LTE-M networks** (Verizon USA and AT&T USA).

••**16 other networks in 10 countries** trialling, demonstrating or planning to deploy LTE-M/Cat-M1 (7 of them with a stated commitment to launch during 2017).

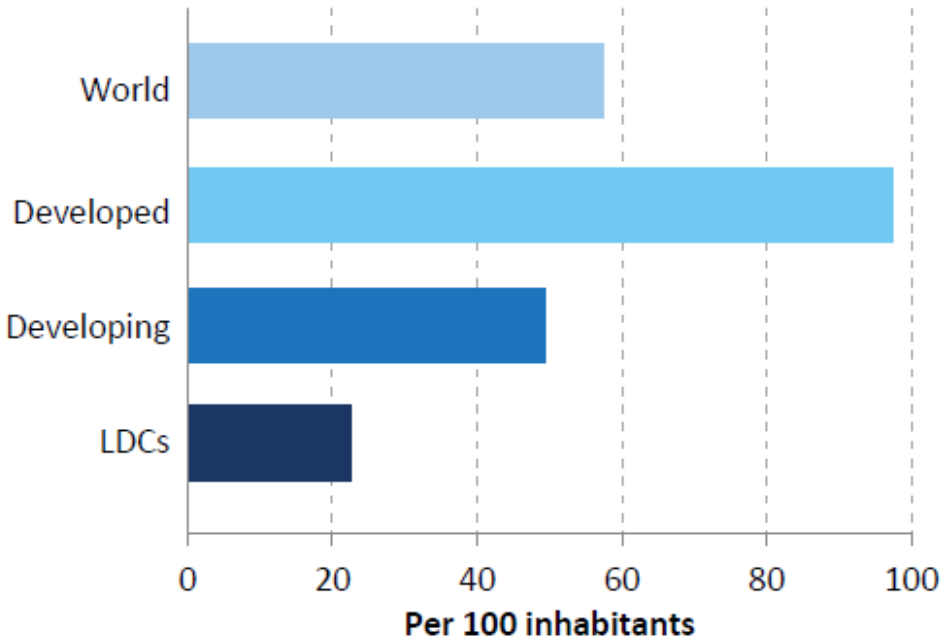


Report: Evolution from LTE to 5G GSA

Growth of mobile-broadband subscriptions, CAGR, 2012-2017*

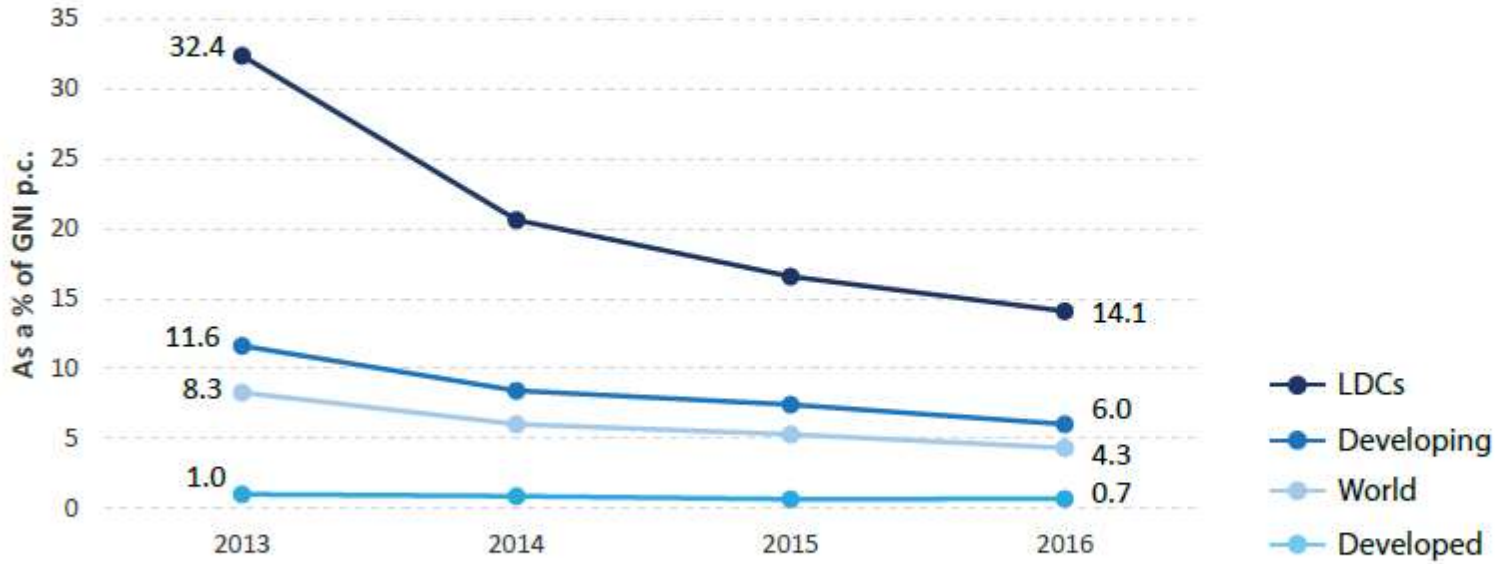


Mobile-broadband subscriptions, 2017*



Source: ITU.
Note: *Estimates. CAGR refers to the compound annual growth rate.

Mobile broadband prices as a percentage of GNI per capita, 2016



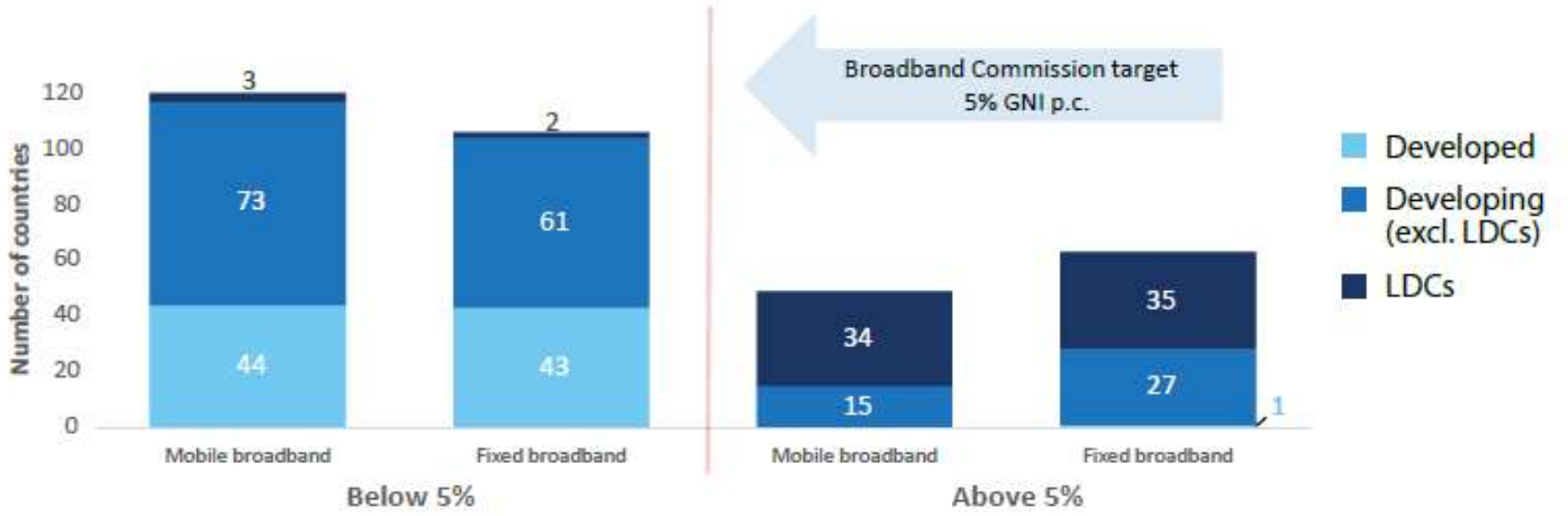
Mobile-broadband prices as a percentage of GNI per capita halved between 2013 and 2016 worldwide.

The steepest decrease ocurred in LDCs, where prices fell from 32.4 to 14.1% of GNI p.c.

Source: ITU.
Note: Based on simple averages including data for 136 countries. Prices are based on entry-level computer-based mobile-broadband plans with a minimum data allowance of 1 GB per month.

Source: ITU

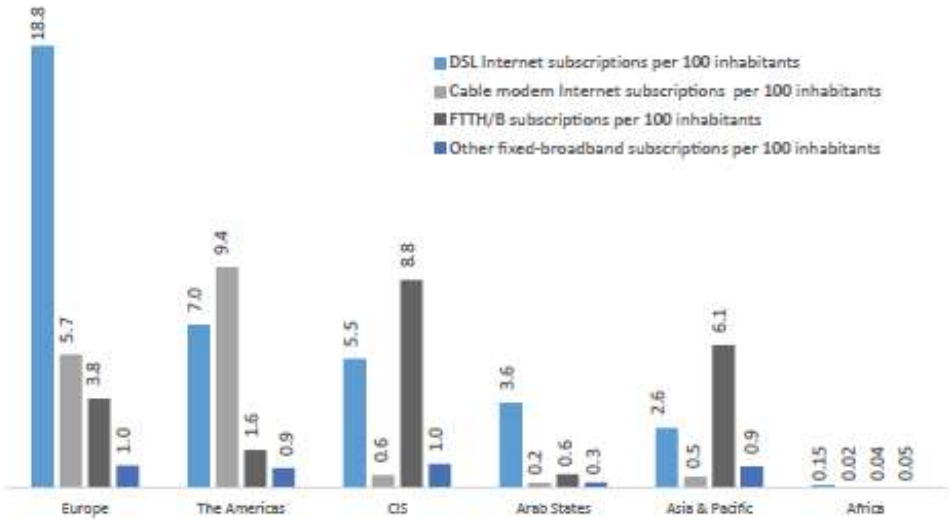
Broadband prices as a percentage of GNI per capita, 2016

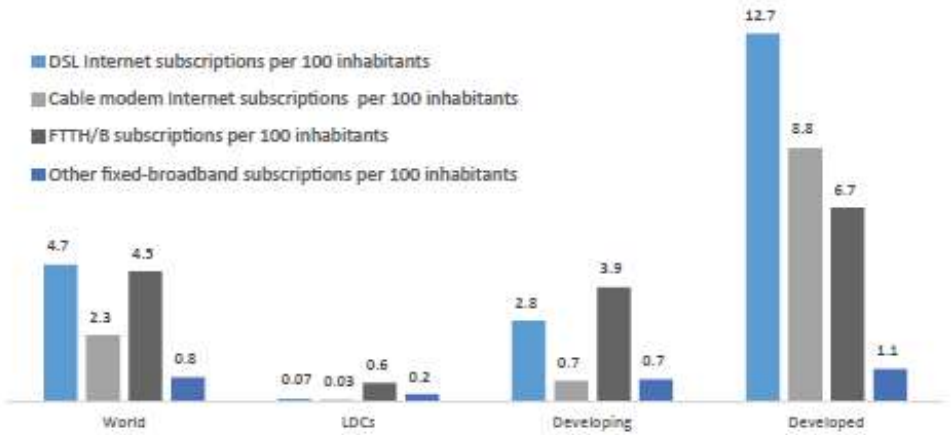


Mobile broadband is more affordable than fixed-broadband services in most developing countries. However, mobile-broadband prices represent more than 5% of GNI per capita in most LDCs and are therefore unaffordable for the large majority of the population.

Source: ITU.
Note: Based on data available for 169 countries. Prices are based on entry-level plans with a minimum data allowance of 1 GB per month.

Fixed-broadband subscriptions per 100 inhabitants, by technology, 2016





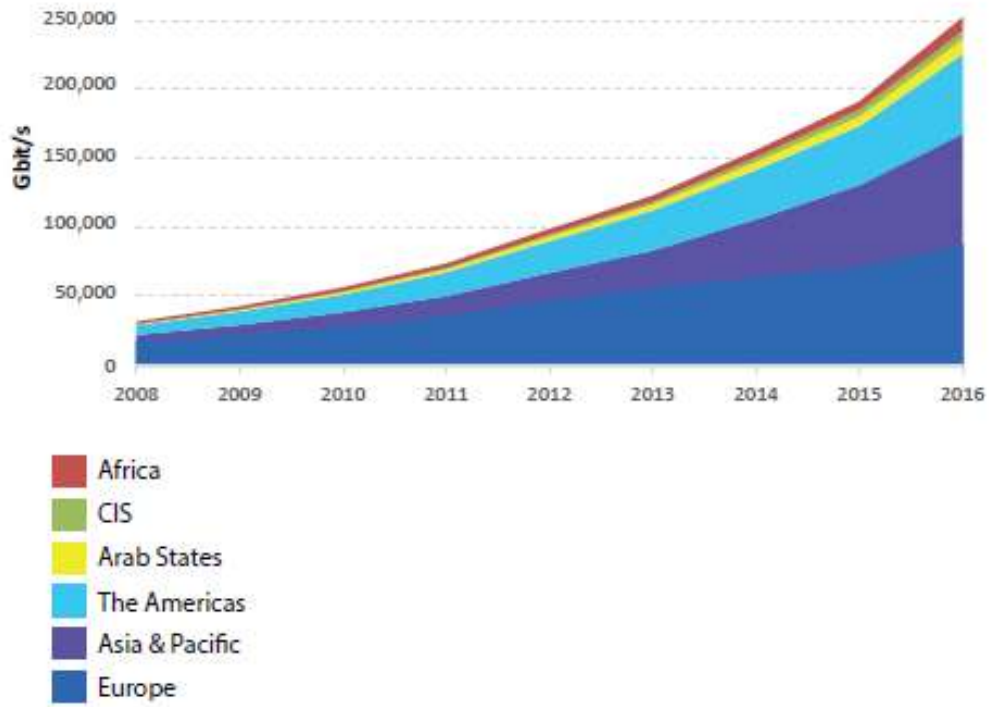
Developing countries and LDCs are deploying fibre infrastructure directly, leapfrogging cable and DSL.

However, the proportion of fibre broadband subscriptions per 100 inhabitants in developed countries is twice as high as in developing countries, and ten times higher than in LDCs.

The share of fibre in total fixed-broadband subscriptions is highest in the CIS and Asia and the Pacific.

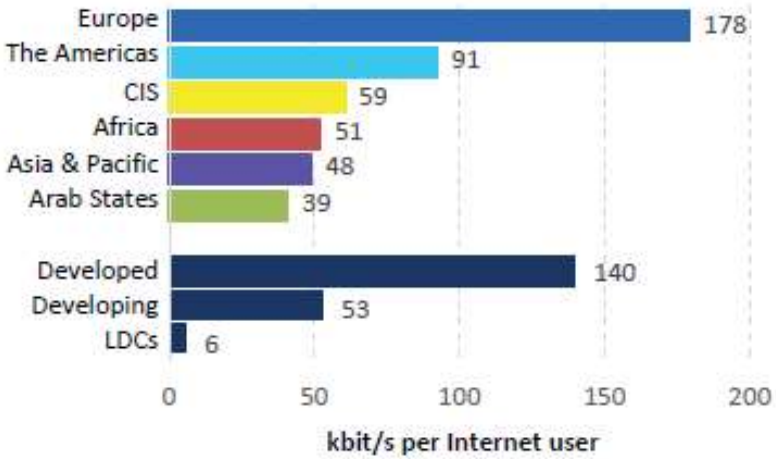
Source: ITU.
Note: Data refer to early 2016. CIS refers to the Commonwealth of Independent States.

International Internet bandwidth in Gbit/s, per region, 2008-2016



Source: ITU.
Note: CIS refers to the Commonwealth of Independent States.

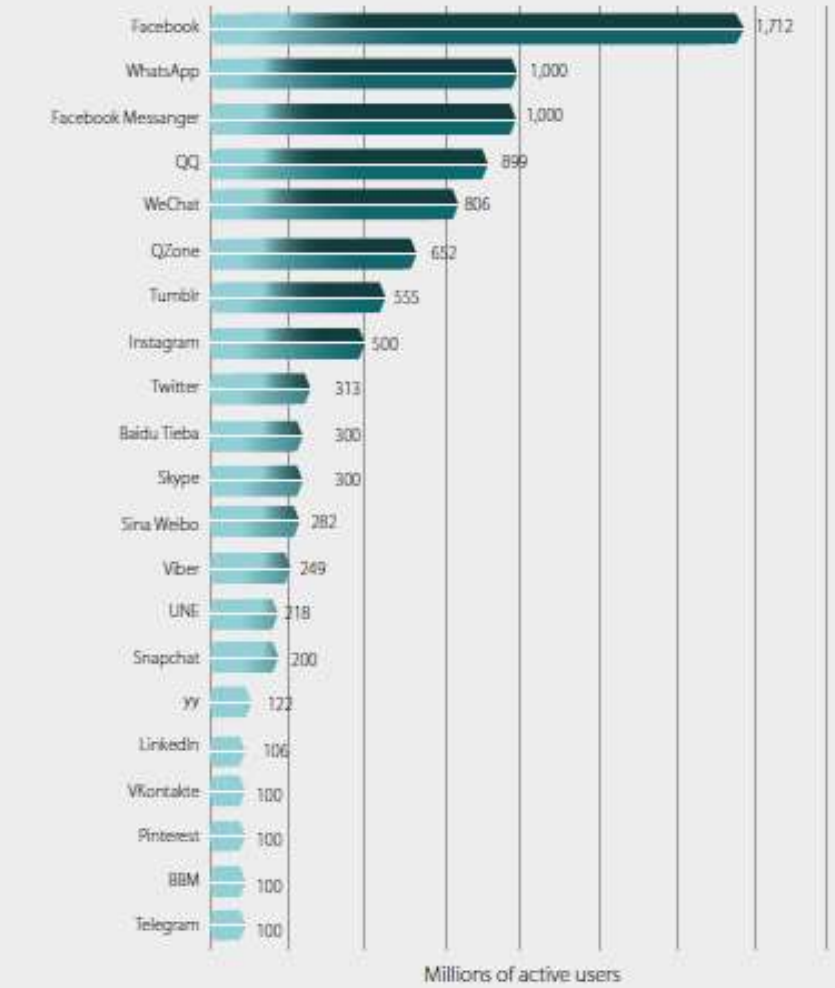
International Internet bandwidth per Internet user in kbit/s, 2016



International Internet bandwidth grew worldwide by 32% between 2015 and 2016. Africa experienced an increase of 72% during this period, the highest of all regions.

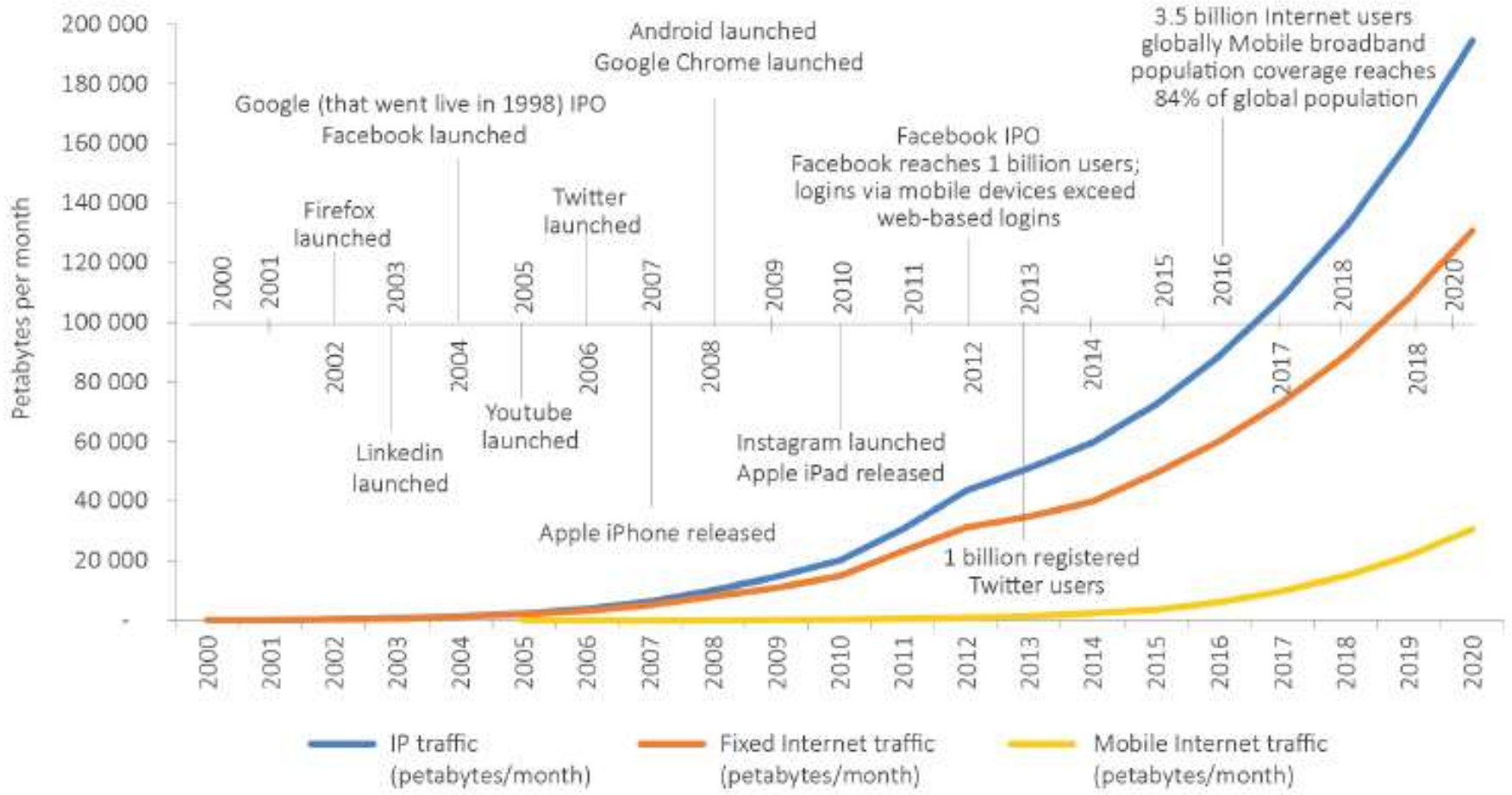
MOST FAMOUS SOCIAL NETWORK SITES WORLDWIDE, 2016, BY NUMBER OF ACTIVE USERS (IN MILLIONS)

Source: Statista



GLOBAL ICT REGULATORY OUTLOOK 2017

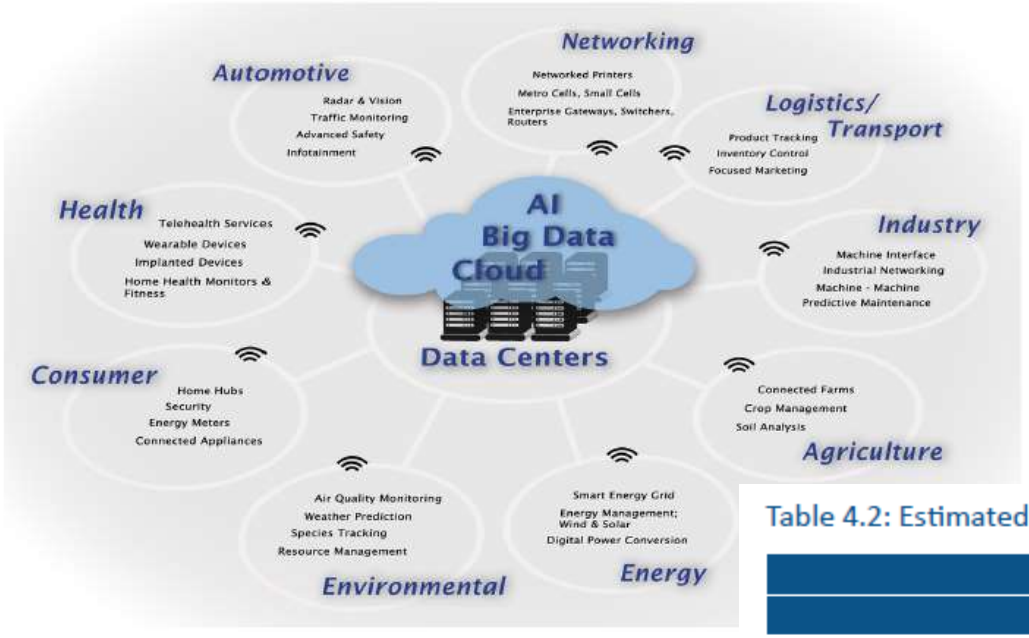
Internet and IP traffic



Note: Fixed Internet traffic refers to traffic through fixed network providers on different platforms. Mobile Internet traffic refers to traffic through mobile-cellular networks. IP traffic refers to the sum of fixed and mobile Internet traffic (denoting all IP traffic crossing an Internet backbone) as well as non-Internet IP traffic (e.g. IP WAN, IP transport of TV and video-on-demand).
Source: ITU based on Cisco and company reports.

IOT, Big Data and Artificial Intelligence – The new drivers of ICT ecosystem

Figure 4.1: IoT, cloud computing, big data and artificial intelligence – the new drivers of the ICT ecosystem



Source: ITU.

Table 4.2: Estimated global market sizes for selected advanced ICTs (USD millions)

	Estimated global revenues		
	2015	2020[a]	2025[a]
IoT[b]	193 500	267 000	640 000[c]
Big data[d]	27 300	57 300	88 500
Public cloud[e]	75 300	278 200	489 800
Artificial Intelligence[f]	644[g]	6 076	36 818

[a]Forecast. [b]Statista (2017b); Hunke et al. (2017). [c]Estimate based on expected compound annual growth rate. [d]Statista (2016, p. 22). [e]Statista (2017a, p. 13). [f]Kaul and Wheelcock (2016). [g]Information for 2016.
Sources: Statista (2016, 2017a, 2017b), Hunke et al. (2017), Kaul and Wheelcock (2016).

Focus……..

Apple

Apple given licence to test self-driving cars on California roads

Company joins race with Uber and Alphabet to shape future of driverless transportation

APRIL 15, 2017 by: **Tim Bradshaw** in California

Baidu

Baidu's shift towards AI starts to bear fruit as profits drop

Jennifer Li to step down as chief financial officer to head capital investment unit

APRIL 28, 2017 by: **Peter Wells** in Hong Kong

Tencent Holdings

China's Tencent to open first US-based AI laboratory

Chinese tech giants race to acquire talent on West Coast

MAY 2, 2017 by: **Yuan Yang**

Microsoft Corp

Microsoft sees its future at the 'intelligent edge'

Nadella sketches out plans for post-smartphone platform that will depend heavily on AI

MAY 11, 2017 by: **Richard Waters** in San Francisco

Artificial Intelligence and Robotics

Google says it is 'rethinking all our products' for the AI age

Developer conference focuses on features such as image recognition

by: **Richard Waters** in Mountain View

Figure 4.3: Cloud traffic worldwide 2014–2020, by region (exabytes per year)

Notes: Regions differ from the ITU classification. * denotes a forecast.
Source: Cisco (2016).

Table 4.6: Measuring emerging ICTs (selected metrics)

	IoT	Big data analytics	Cloud computing	Artificial intelligence
Direct measures				
Hardware	Number of connected devices; Revenues in IoT device markets	Percentage of data centre capacity dedicated to big data analytics; Investment in data analysis centres	Number of data centres; information processing capacity of data centres; Investment in cloud facilities	Number of cognitive computing/deep learning installations; Number of robots; Revenue of artificial intelligence chip manufacturers
Basic services and software	Number of M2M subscriptions	Revenues for big data analysis software	Revenues for IaaS, SaaS, PaaS	Share of small, medium and large businesses using cognitive computing
Intermediate applications and services	Number of smart homes; Number of smart city applications; Revenues generated by IoT applications and services	Percentage of businesses and government organizations using big data analytics; Revenues generated by data analytics services	Percentage of businesses and government organizations using cloud computing; Revenues generated from cloud computing applications	Percentage of businesses and organizations using artificial intelligence applications; Revenues generated by artificial intelligence applications
Enabling conditions				
Connectivity	Percentage of population covered by mobile broadband; Percentage of population covered by fixed broadband; Available bandwidth; Quality of connectivity; Access to cloud resources; Adoption of broadband; Share of small, medium and large businesses using cloud resources; Percentage of population using cloud resources			
Human capital	Number of data scientists; Number of computer scientists; Percentage of schools with broadband connectivity			
Policy arrangements	Flexible spectrum policy; Policies toward bottlenecks and market power; Interoperability requirements; Standardization; Promotion of experimentation and innovation; Open data policies			
Effects on SDGs, welfare and well-being				
Welfare effects	Efficiency gains; Improvements in service quality; Better service/price relationship; Improvements in health, education, safety, care of elderly, empowerment, environmental stewardship, etc.			

Source: ITU.

EXAMPLES OF RECENT MERGERS AND ACQUISITIONS INVOLVING ICT PLAYERS, 2016 - JANUARY 2017

Legend: Status: A= approved; C=completed; D=in discussions; O=ongoing; P=preliminary.
Note: * Acquisition, the acquirer is listed first; ** Merger

Country	Companies			Sector	Strategic objective
Pattern: Convergence					
Brazil	**Telefónica Spain	AxisMed Brazilian chronic-care management provider working with health care providers to remotely monitor outpatient conditions	C	Mobile/Apps	e-health profiling
China	* LeEco (video content creation, smartphones, cloud, online finance)	Vizio, US-based smart television manufacturer	C	Content/ apps/ hardware/pay-TV	Enhance content creation capabilities
US	*AT&T	Time Warner	A	Wireless/ISP/media	Complement its distribution network
US	*Verizon Communications Inc	Yahoo's operating business; Fleetmatics (fleet and mobile workforce management); Vessel (online video subscription service) and Telogis (cloud platform for fleet tracking)	A	Fibre/cloud/IoT	Accelerate OTT video efforts and enhance content discovery
Global	**Cisco	AppDynamics (application intelligence software & cloud)	O	IT/IoT/apps	Strengthen market position
Global	*SoftBank Group Corporation	ARM Holdings plc	C	Mobile/ ISP/IoT	
Global	Oracle Corporation	NetSuite, Inc.	O	IT/cloud	Transition to cloud
Global	Micro Focus International plc	Software Business division of Hewlett-Packard Enterprise	C	IT/big data/security	Change of focus
Global	*Apple	Flyby Media (AR); Emotient (AI); Leart Sprout (e-education); Turi & Toplejump (Machine Learning); Glimpse (wearable e-health)	C	Software	Expanding focus
Global	*Google	Orbitera (cloud software); Anvato (Cloud-based video); APLAI (AI); Eyefluence (VR); Webpass (ISP); Cronologics (smartwatches)	C	IoT/ AI	Expanding focus
Global	*General Motors	Cruise Automation (autonomous vehicles)	C	Software/	Strengthen long-term market position
Global	*Unilever	Dollar Shave Club (online men's razor merchant)	C	IoT/AI	Enhance competitiveness
Global	* Wal-Mart Stores, Inc.	Jet.com (online retailer)	A	Vehicules/ Automation	Compete with OTTs

Source: ITU research.

Key Trends

Concurrent advances in the Internet of Things (IoT), big data analytics, cloud computing and artificial intelligence (AI) will enable tremendous innovations and fundamentally transform business, government, and society.

The Internet of Things will greatly expand the digital footprint

Big data analytics will extract useful knowledge from digital information flows.

Cloud and other architectures will lower the entry barriers to scalable computing resources.

Artificial intelligence will help human beings to make better decisions

Advanced ICTs, such as IoT, big data analytics, cloud computing and AI, contribute to realizing the Sustainable Development Goals (SDGs).

Harnessing the benefits of advanced ICTs requires appropriate infrastructures, services, and skills.

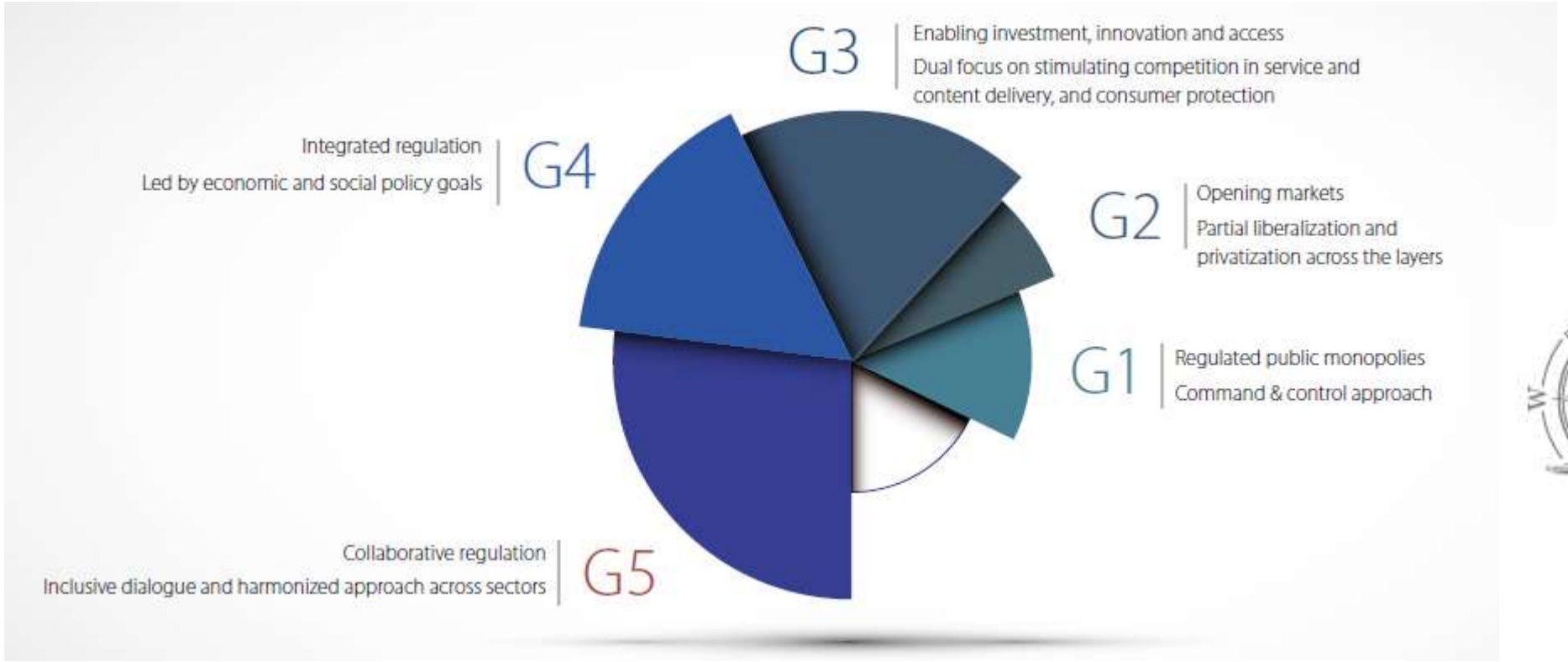
Advanced ICTs raise concerns over next-generation digital divides.

Advanced ICTs can be adapted to specific local and national needs.

Reliable and meaningful measurements of the deployment and use of advanced ICTs are critical

Evolution of Regulation

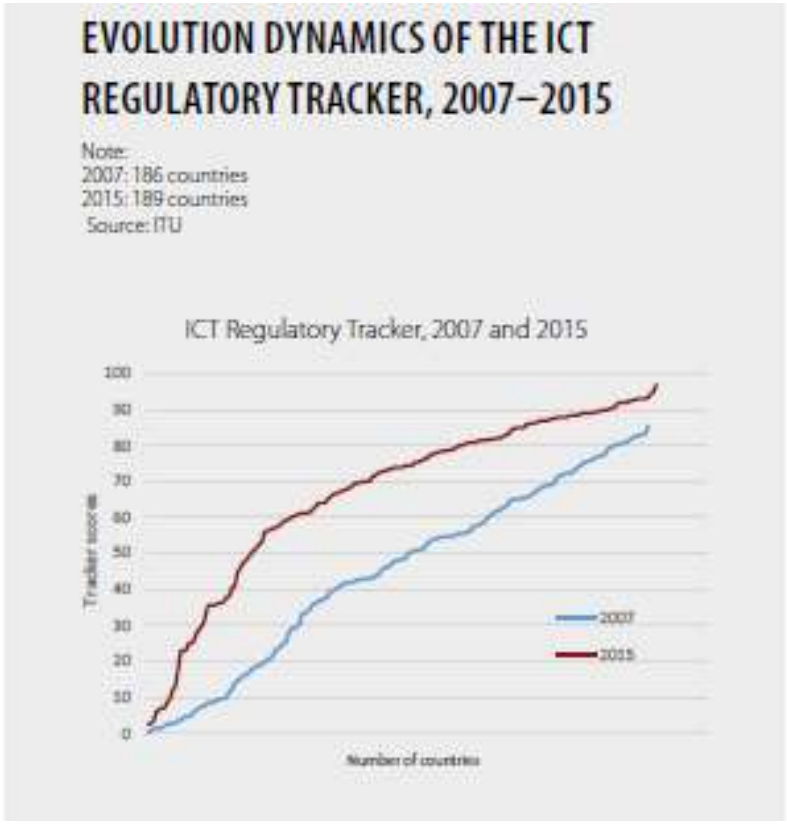
Evolution of ICT Regulation



Source: ITU

Figure 25:
EVOLUTION OF THE REGULATORY AUTHORITY

Source: ITU.

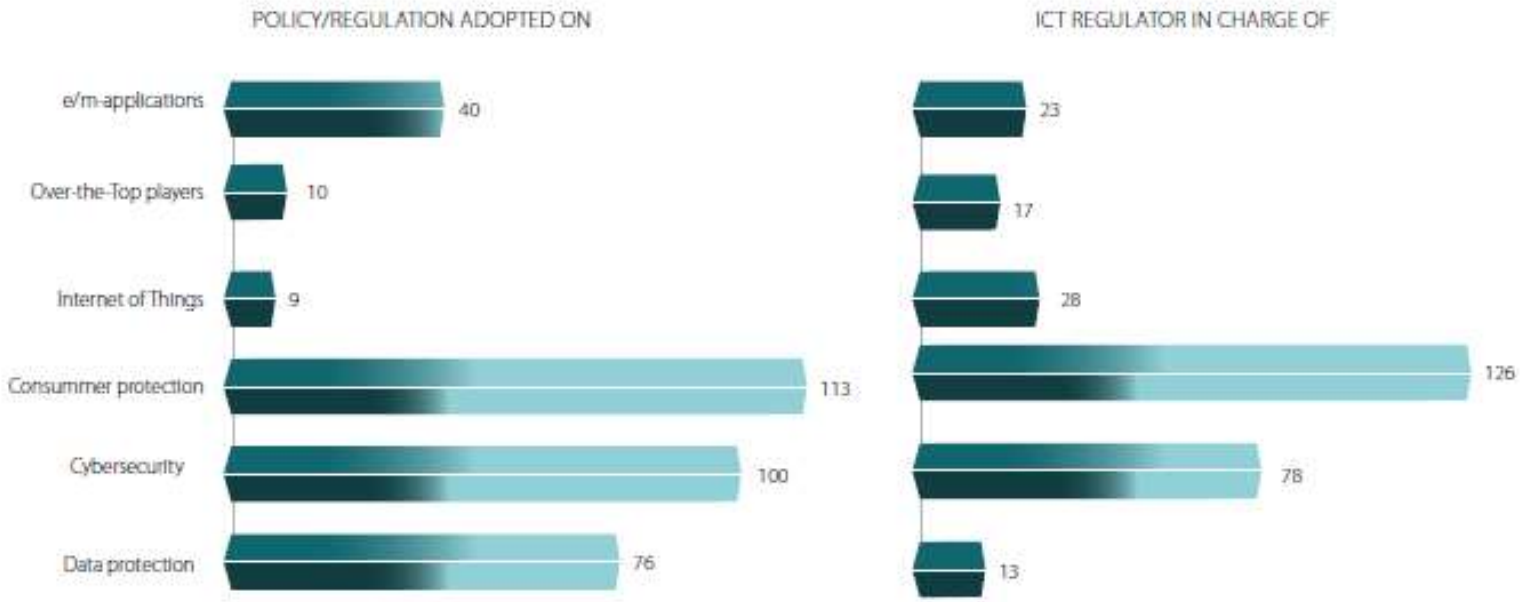


ICT Regulatory Tracker
Score breakdown
G1: ≥ 0 <40
G2: ≥ 40 < 70
G3: ≥ 70 < 85
G4: ≥ 85 ≤ 100

GLOBAL ICT REGULATORY OUTLOOK 2017

NEW AREAS OF REGULATION AND THE ROLE OF THE ICT REGULATOR, WORLDWIDE, 2015

Source: ITU.



GLOBAL ICT REGULATORY OUTLOOK 2017

Cybersecurity commitments and Index

Global Cybersecurity Index (GCI) 2017

Table 5.1: Top ten most committed countries, GCI (normalized score)

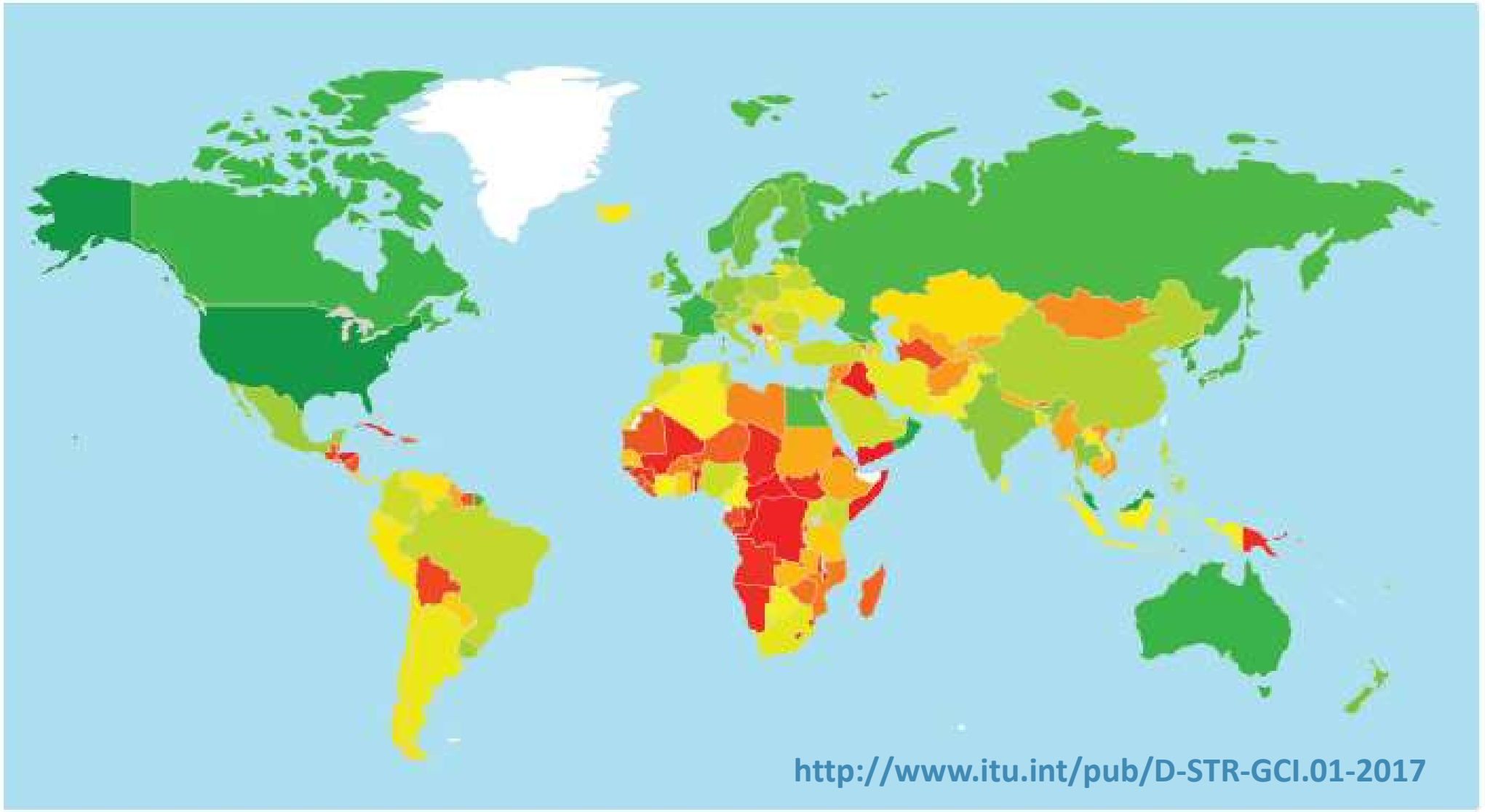
Country	GCI Score	Legal	Technical	Organizational	Capacity Building	Cooperation
Singapore	0.92	0.95	0.96	0.88	0.97	0.87
United States	0.91	1	0.96	0.92	1	0.73
Malaysia	0.89	0.87	0.96	0.77	1	0.87
Oman	0.87	0.98	0.82	0.85	0.95	0.75
Estonia	0.84	0.99	0.82	0.85	0.94	0.64
Mauritius	0.82	0.85	0.96	0.74	0.91	0.70
Australia	0.82	0.94	0.96	0.86	0.94	0.44
Georgia	0.81	0.91	0.77	0.82	0.90	0.70
France	0.81	0.94	0.96	0.60	1	0.61
Canada	0.81	0.94	0.93	0.71	0.82	0.70

http://www.itu.int/pub/D-STR-GCI.01-2017

Global Cybersecurity Index (GCI) 2017

Level of commitment: from **Green (highest)** to **Red (lowest)**

GCI Heat Map



Global Cybersecurity Index 2017

Figure 6.4.2: Asia and the Pacific Region Scorecard

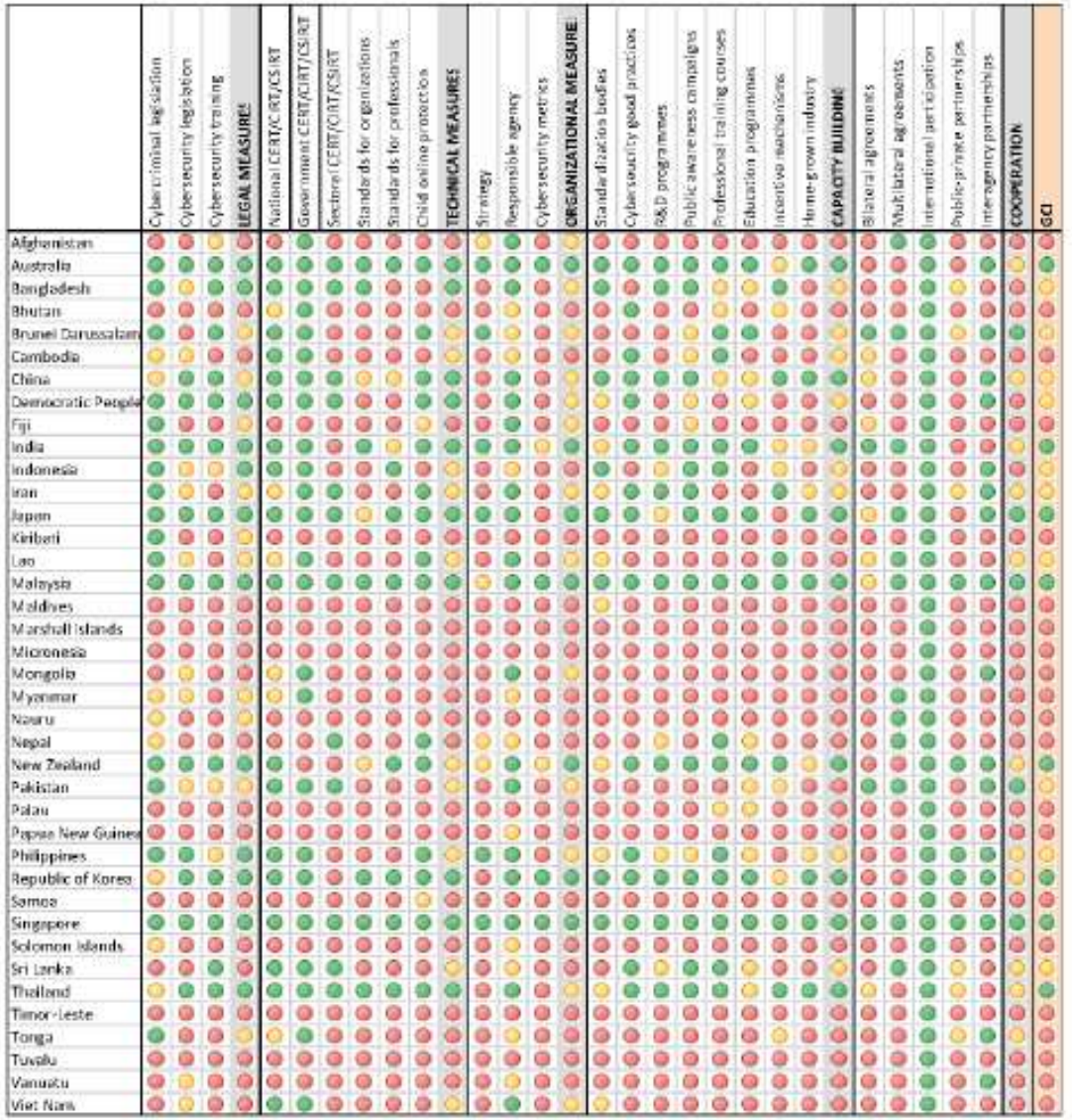


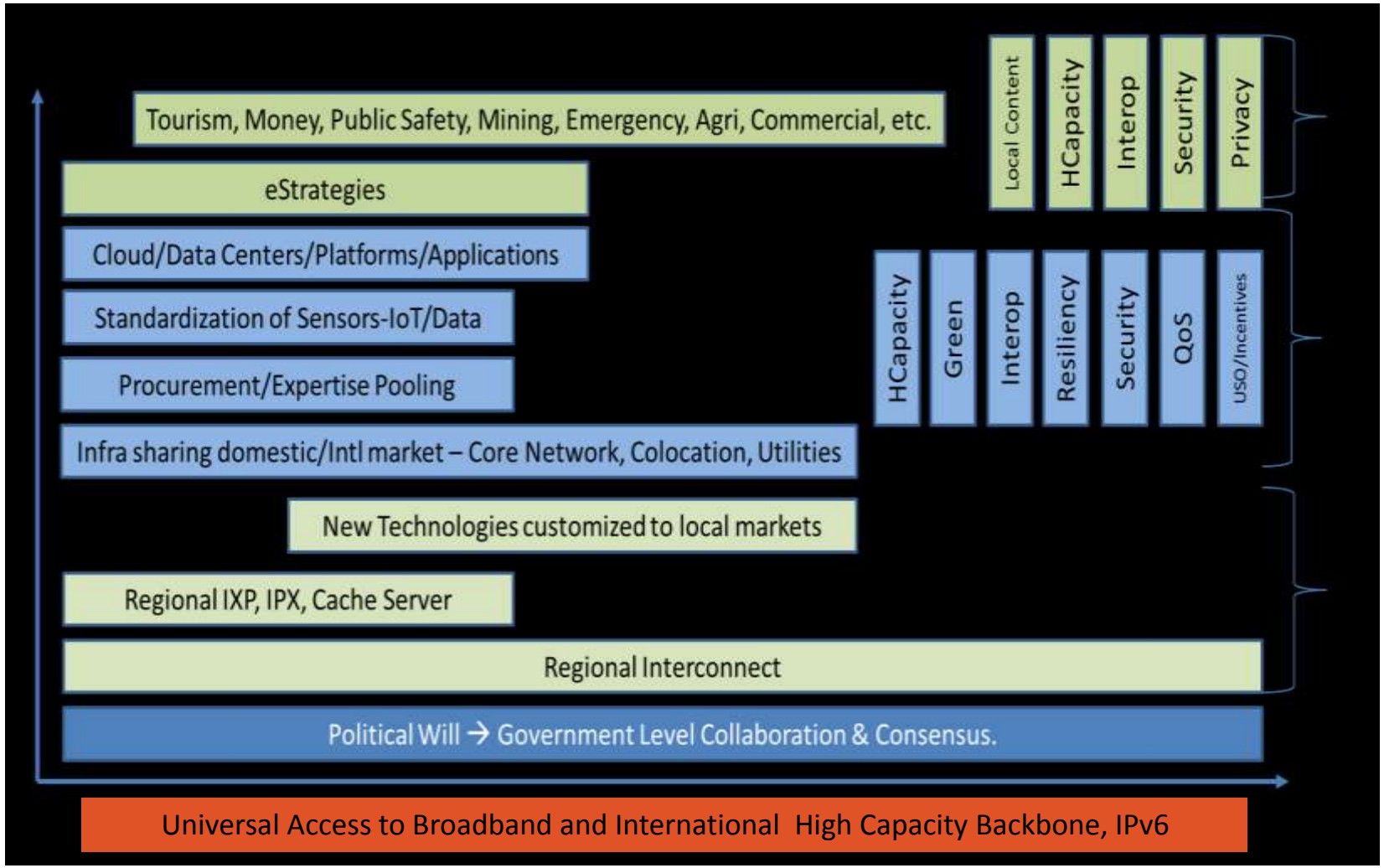
Table 6.4.1: Top three ranked countries in Asia and the Pacific

Country	GCI Score	Legal	Technical	Organizational	Capacity Building	Cooperation
Singapore	0.92	0.95	0.96	0.88	0.97	0.87
Malaysia	0.89	0.87	0.96	0.77	1	0.87
Australia	0.82	0.94	0.96	0.86	0.94	0.44

- *Initiating stage* refers to the 96 countries (i.e., GCI score less than the 50th percentile) that have started to make commitments in cybersecurity.
- *Maturing stage* refers to the 77 countries (i.e., GCI score between the 50th and 89th percentile) that have developed complex commitments, and engage in cybersecurity programmes and initiatives.
- *Leading stage* refers to the 21 countries (i.e., GCI score in the 90th percentile) that demonstrate high commitment in all five pillars of the index.

Telecom Strategy for the Pacific

RECAP WORKSHOP: TELECOM IN THE PACIFIC- NEXT 5 YEARS ROADMAP

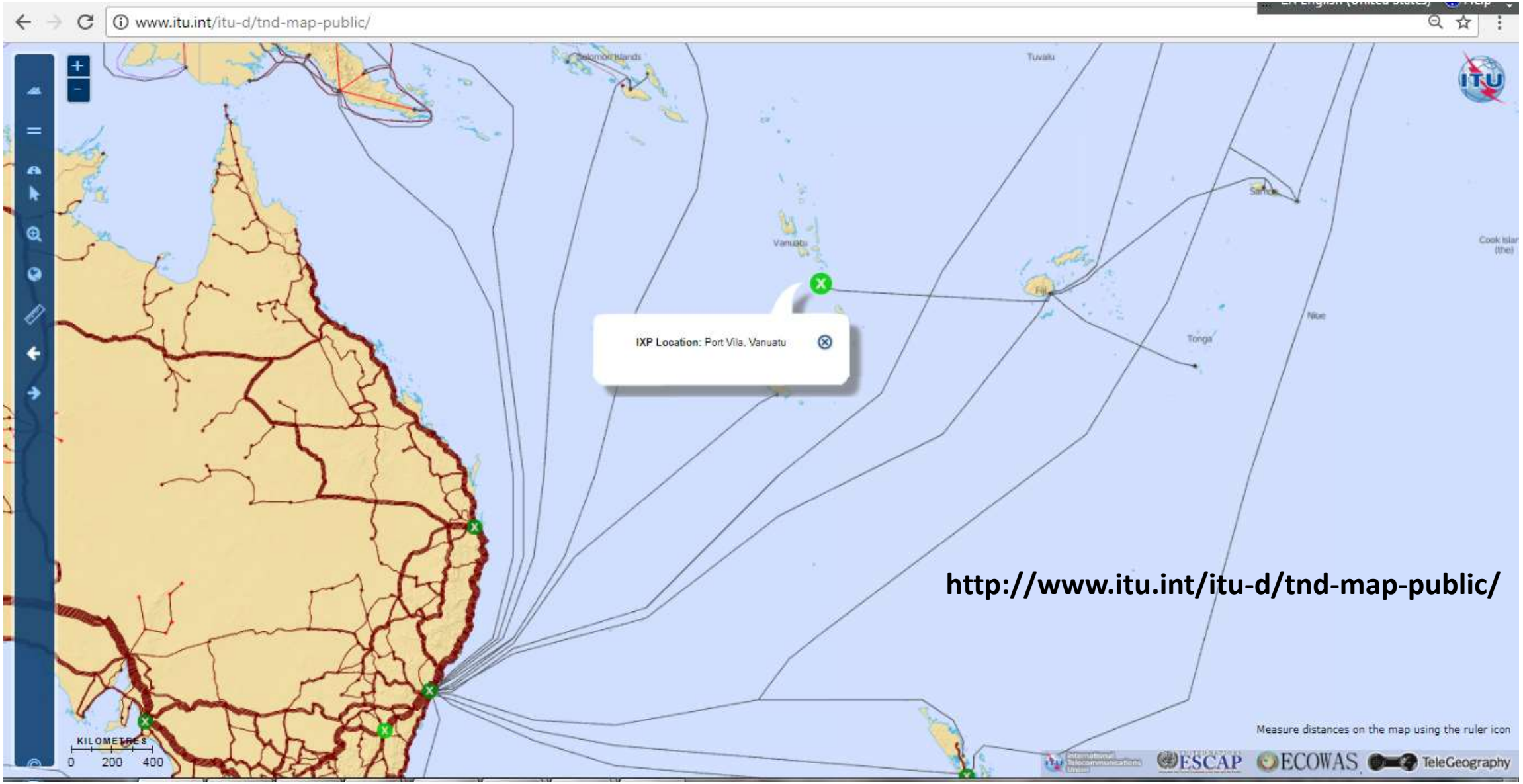


Key issues for telecom sector in the Pacific

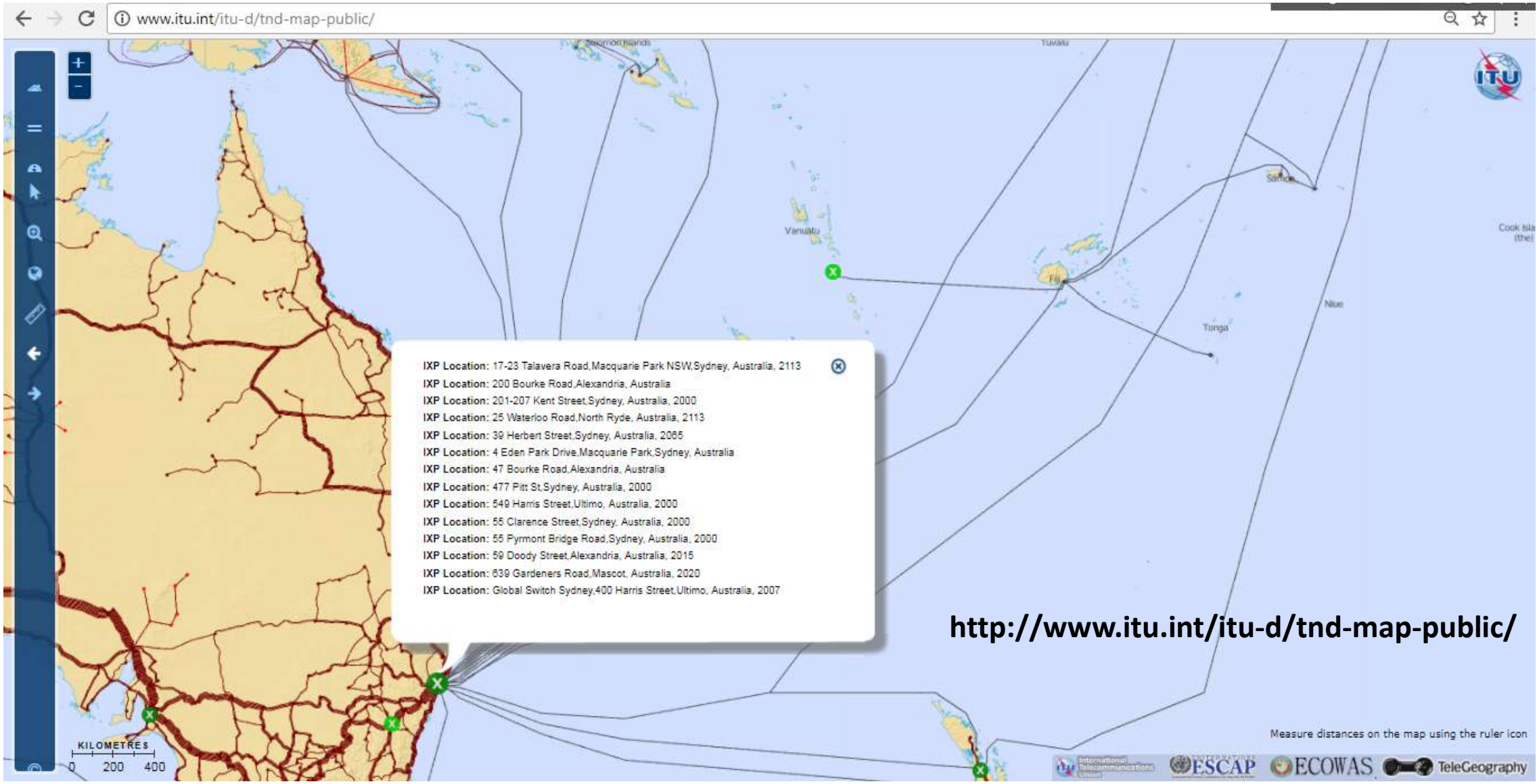
- **Fostering applications ecosystem**
- **Promoting sharing of resources**
- **Optimizing regional traffic**
- **Universal access to broadband and international high capacity backbone**
- **Collaborative G5 Regulation**

International Connectivity and the Pacific

Interactive maps (Terrestrial, Submarine Cable, IXP, others)



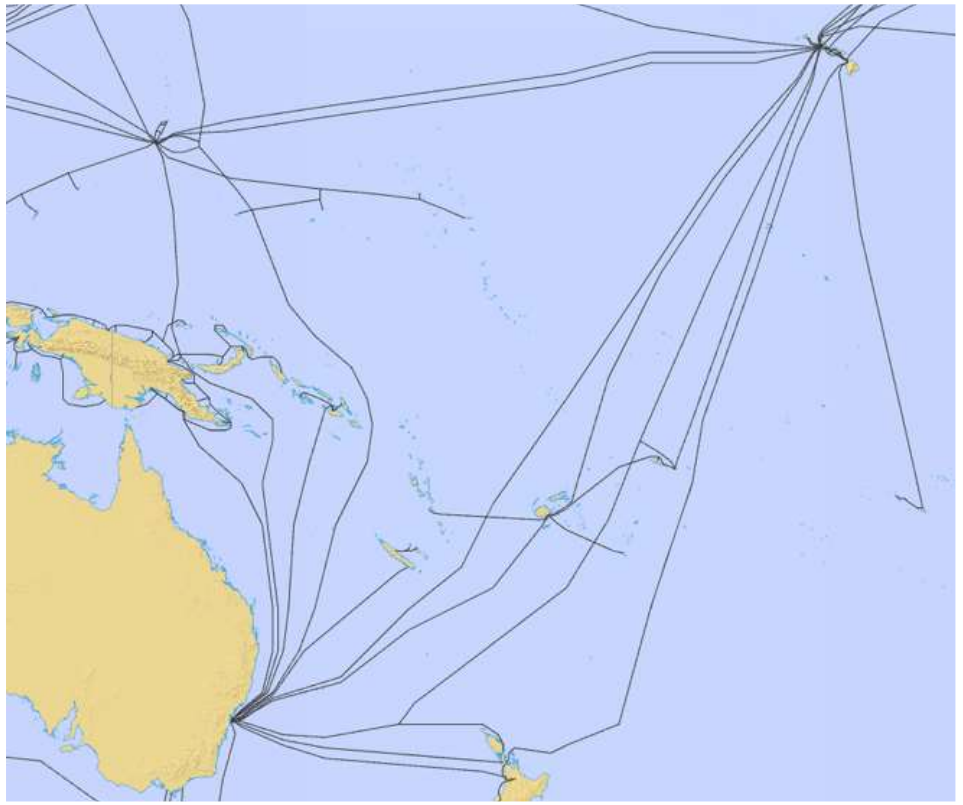
Interactive maps (Terrestrial, Submarine, IXP, others)



http://www.itu.int/itu-d/tnd-map-public/

Number of international submarine cables connected to each Pacific island

Country	Currently active	Proposed additional	Country	Currently active	Proposed additional
American Samoa	2	0	Palau	0	1
CNMI	1	1	PNG	2	1*
Cook Islands	0	1	RMI	1	0
FSM	1	2	Samoa	1	5
Fiji	3	2	Solomon Islands	0	1
French Polynesia	1	1	Tokelau	0	1
Guam	10	3	Tonga	1	0
Kiribati	0	2	Tuvalu	0	1
Nauru	0	1	Vanuatu	1	0
New Caledonia	1	0	Wallis and Futuna	0	1
Niue	0	1			



** As a replacement for an existing cable*

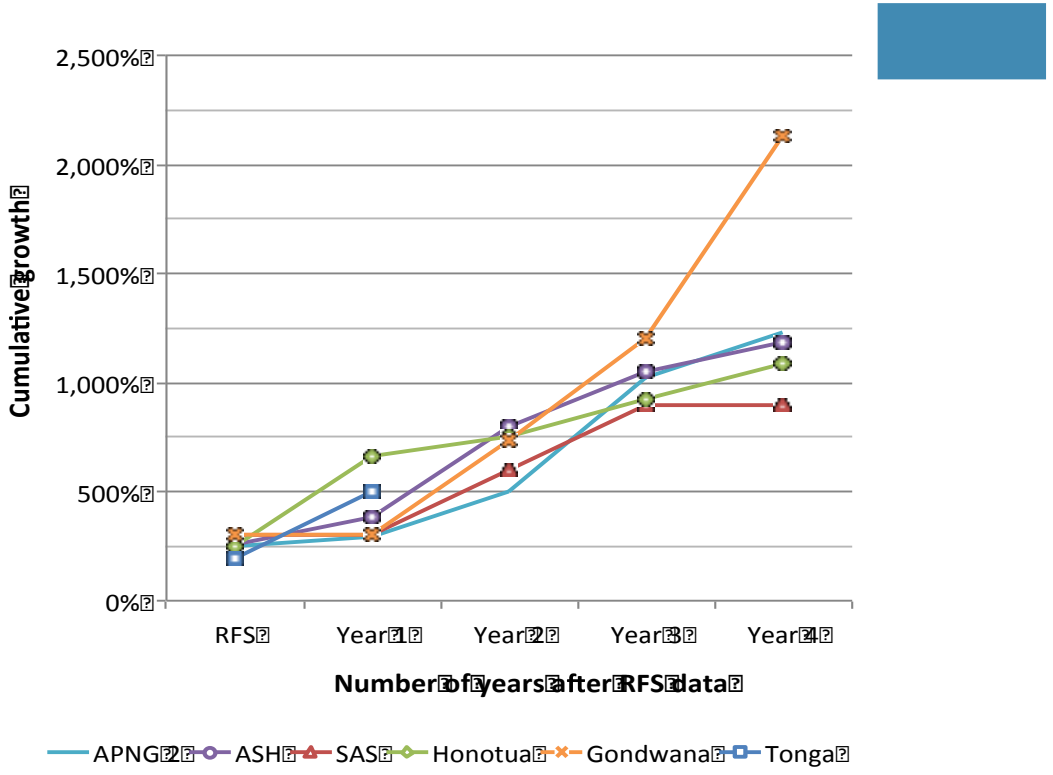
Draft Report : Maximising availability of international connectivity in the Pacific

Pacific Islands: Bandwidth and Cable

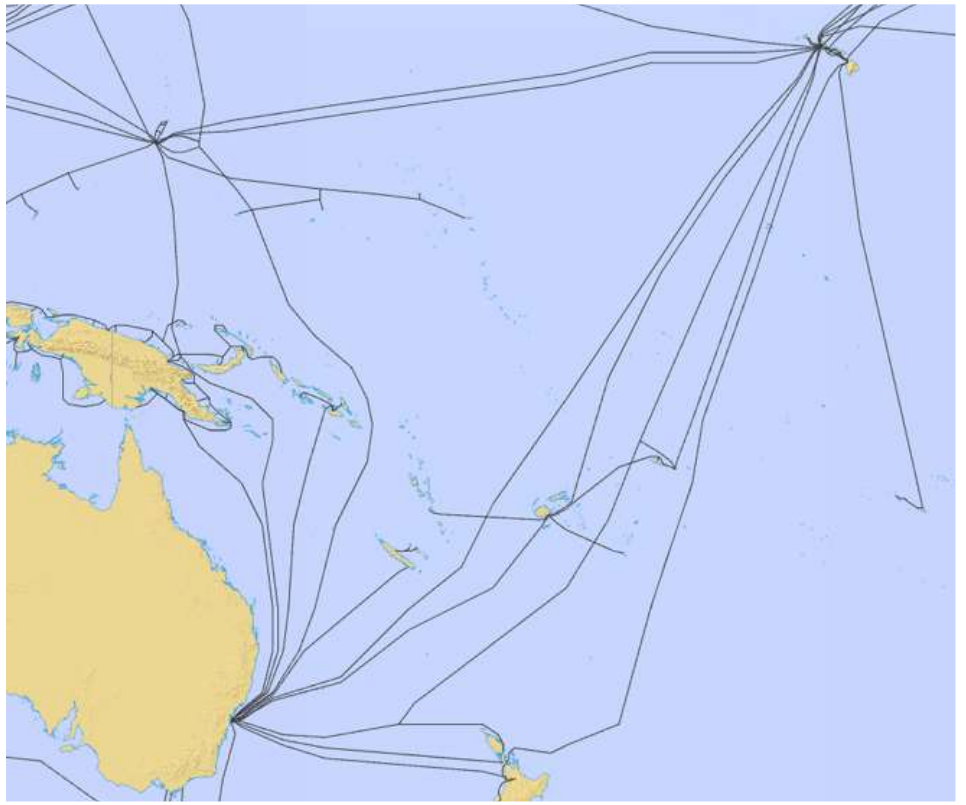
	International bandwidth capacity (in Mbps)	Submarine Cable	Number of international Cables	Wholesale price (US$ per Mbps)
Cook Islands	500	No	0	
Niue	48	No	0	
Marshall Islands	2500	Yes	1	50
Micronesia	4000	Yes	1	
PNG	15040	Yes	2	1200
Tuvalu	95	No	0	1592
Vanuatu	1418	Yes	1	
Fiji	20000	Yes	3	50
Kiribati	200	No	0	
Tonga	1210	Yes	1	100
Samoa	1500	Yes	1	500
Solomon Islands	785	No	0	
Tokelau	25	No	0	
American Samoa	1300	Yes	1	500

International bandwidth usage, in Mbit/s: *'Average usage of all international links including fiber-optic cables, radio links and traffic processed by satellite ground stations and teleports to orbital satellites (expressed in Mbit/s). All international links used by all types of operators, namely fixed, mobile and satellite operators should be taken into account. The average should be calculated over the 12-month period of the reference year. For each individual international link, if the traffic is asymmetric, i.e. incoming traffic is not equal to outgoing traffic, then the higher value out of the two should be provided. The combined average usage of all international links can be reported as the sum of the average usage of each individual link.'*

Cumulative rates of growth in wholesale demand for international connectivity following the commissioning the first international submarine cable



Source: Hibbard Consulting



Source: ITU, Telegeography

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Proposed international submarine cables serving Pacific island

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Cable	Routing	Cable length (km)	Proposed RFS date	Owners
SEA-US	Indonesia – Guam – Philippines – US, with BUs to Palau and FSM	14,500	Aug 2017	RTI, Inc., Globe Telecom (US) Hawaiian Telcom (US) GTA TeleGuam (GU) Telin (ID) Balau Submarine Cable Co (PW) FSMTC (FM)
Hawaiki	Australia – New Zealand – American Samoa – US	10,200	June 2018	Hawaiki Cable Co (NZ)
Tui-Samoa	Samoa – Wallis and Futuna – Fiji	1,470	Dec 2017	Samoa Submarine Cable Company (WS)
Atisa	Guam – CNMI	279	June 2017	Docomo Pacific (GU)
Hong Kong – Guam (HK-G)	Guam – China	3,900	2019	RTI Connectivity (SG)
Solomon Islands Submarine Cable	Australia – Solomon Islands	4,500	2019	Solomon Islands Cable Co (SI)
East Micronesian Cable	FSM – Nauru – Kiribati	>2,000	Under development	Under development
Manatua	Samoa – French Polynesia – with BUs to Cook Islands and Niue	>4,500	2019	Under development
Samoa – Tokelau – Tuvalu	Samoa – Tokelau – Tuvalu	>1,500	Proposal only	Proposal only
Southern Cross NEXT	Australia – US with BUs to New Zealand, Fiji, Samoa, Kiribati, and/or Tokelau	12,500	Pacific island spurs are proposals only	Spark (NZ) Singtel Optus (AU) Verizon (US)

Existing and Planned National Submarine Cables

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Country	Islands being connected	Cable length (km)	RFS Date
Cook Islands*	Rarotonga – Aitutaki	264	2019
CNMI*	Saipan – Tinian – Rota	281	June 2017
FSM	Pohnpei – Yap* Pohnpei – Chuuk Pohnpei – Kosrae	2,236 741 550	2017
Fiji*	Suva – Savusavu	95	Dec 2017
French Polynesia*	Tahiti – Moorea – Raiate – Bora Bora	-	2010
French Polynesia	Tahiti – Rangiroa – Manihi – Takaroa – Kaukura – Arutua – Fakarava archipelago – Makemo – Hao – Hiva Oa – Nuku Hiva	2,500	2018
New Caledonia	Grand Terre – Mouli – Lifou	>200	2008
Palau	Babeldaob (festoon) – Koror – Peleliu	148	1996
Papua New Guinea	Festoon linking 14 population centres	5,457	Proposal only
RMI*	Majuro – Kwajalein	>470	2010
Samoa*	Apia – Savaii	76	Dec 2017
Solomon Islands*	Honiara – Auki – Noro	333	2019
Tokelau*	Atafu – Nukunonu – Fakaofu	165	Proposal only
Tonga	Tongatapu – Ha'apai – Vava'u	310	2018
Wallis and Futuna*	Wallis – Futuna	260	Dec 2017

** Source: Operators' websites*
** In tandem with the construction of an international submarine cable*

Geostationary satellites providing broadband connectivity to Pacific islands

Draft Report : Maximising availability of international connectivity in the Pacific

Operator (Satellite)	Launch date	Position	Transponder capacity	Countries with contracted capacity or interest
EUTELSAT (EUTELSAT 70B)	Dec 2012	70° E	48 Ku-band transponders	
APT (APSTAR 6)	April 2005	134° E	38 C-band transponders (and 12 Ku-band transponders providing coverage outside the region)	
APT (APSTAR 6C)	Planned (launching Dec 2018)	134° E	45 transponders in C, Ku, and Ka bands. Will replace APSTAR 6.	
Telesat (Telstar 18, aka APSTAR 5)	June 2004	138° E	54 C-band transponders	
APT (APSTAR-9)	Oct 2015	142° E	32 C-band transponders (and 14 Ku-band transponders providing coverage outside the region)	
MEASAT (Measat 2A)	Planned (launching Dec 2018)	148° E	C-band and Ku-band capacity	
SKY Perfect JSAT (JCSat 2B)	May 2016	154° E	26 C-band and 18-Ku-band transponders. Will replace JCSat 2A.	
ABS (ABS-6)	Sep 1999	159° E	28 C-band and 16 Ku-band transponders	Kiribati, Samoa, Tuvalu
Intelsat (Intelsat 19)	May 2012	166° E	24 C-Band and 34 Ku-Band transponders	Fiji, FSM, New Caledonia
SES (NSS-9)	Feb 2009	177° W	44 C-band transponders	Fiji
JCSat 18 (Kacific-1)	Planned (launching Dec 2019)		Ku and Ka-band HTS (56 narrow beams)	Tuvalu, Vanuatu

Sources: operators' websites, Satbeams SPRL

Regulation of access to and pricing of submarine cable capacity in the Pacific Islands

Draft Report : Maximising availability of international connectivity in the Pacific

	General open access obligation			Specific regulation of access pricing	
	Under law	Under licence	Regulation	Reference offer	Regulation
American Samoa	No	Yes*	No	No	No
CNMI	No	Yes*	No	No	No
FSM	Yes#	No	No	No	No
Fiji	No	No	No	No	Yes. Price cap.
French Polynesia	No	No	No	Yes	Yes
Guam	No	Yes*	No	No	No
New Caledonia	No	No	No	Yes	Yes
Palau	Yes	No	No	Yes	No
PNG	Yes	No	No	No	No
RMI	No	No	No	No	No
Samoa	Yes	No	No	Yes	Yes. Price approval.
Tonga	Yes	Yes	Yes	Yes	Yes. Price setting.
Vanuatu	No	No	No	No	Yes. Price approval.

Sources: operators' and regulators' websites, workshop delegates.

** Only if the cable system is licensed on a common carrier basis. Cable systems may also be licensed and operated on a non-common carrier basis under the FCC's private submarine cable policy if the FCC concludes that the operator will be unable to exercise market power because of existence of sufficient alternatives in the form of other landed cables.*

 # Potentially. Section 389 of the FSM Telecommunications Act of 2014 provides for the establishment of an open access entity.

Common challenges for submarine cable projects in the Pacific islands

Draft Report : Maximising availability of international connectivity in the Pacific

Financing • How best to use grant funding? • How to cover annual operational expenses?	Limited resources and technical capabilities • Human resources • Power
Policy and regulation • Political risk/interventions • Permits and licences • Underdeveloped regulatory frameworks	Wholesale pricing • Small market size • Low utilisation • Retail affordability
National fibre distribution • Aging infrastructure • Inter-island connectivity • Financing	Location of the cable landing station • Land ownership/custom title • Distance from beach manhole
Maintenance and repairs	Technology upgrades
Environmental factors	

Source: ITU PITA Workshop on Enhancing Submarine Cable Access in the Pacific, 30 July- 3 Aug, 2017

DRAFT Recommendations to maximise the availability of international connectivity in the region

- **Financial structure**. The lower the cost of capital, the cheaper the wholesale pricing of capacity will be. Governments should take advantage of the special advantages provided by development aid in this context and use it strategically with a view to achieving long-term broadband-enabled economic and social development.
- **Regional collaborations**. Partnering to construct and operate point-to-point cable links can improve the feasibility and timeliness of such projects, enable more islands to be connected directly, foster the development of additional hubs, share the burden of repair contingency costs, promote greater integration, and better utilise the limited skills and capital available in the region.
- **Connections of opportunity**. The opportunity to gain access to a larger trans-Pacific cable during its planning stage should be exploited if and when they arise. This may be increasingly important for the establishment of connections to outer islands and inter-island links in the future.
- **Telecommunications licensing**. As the telecommunications legal and regulatory frameworks of many Pacific islands may not have anticipated the landing of a submarine cable, it may be necessary to review, update and complete these laws and regulations. Key areas for attention will tend to be licensing and access regulation (including price regulation). Consideration should be given to whether a new type or special category of licence is necessary to fit the circumstances of the landing station operator. Fixed licence periods, where they exist, should be longer than 15 years and ideally matched to the design life of the cable to enable the licensee to continue selling (or at least offering) long-term IRUs during the term of the licence.

DRAFT Recommendations to maximise the availability of international connectivity in the region (continued)

- **One-stop-shop.** In addition to some form of telecommunications licence, there may be a range of other licences and authorisations required to lay and land a submarine cable. For example, approval of the cable route and cable laying activity by a maritime authority; authorisations to construct beach manholes, bury terrestrial cables, or construct and power landing stations on public or customary land. This process could be simplified and sped up by establishing a "one-stop-shop" with all the necessary authorities, or alternatively my appointing a coordinating authority.
- **Access regulation.** Regulatory oversight of price and non-price terms and conditions of access to (landed) capacity and also co-location space in cable landing stations will tend to be necessary given the absence of competition in these markets in this region. Innovative regulatory interventions in wholesale pricing may be necessary, particularly during the early years of the cable, to help reduce risk and demand uncertainity, encourage greater utilisation, and help the landing station operator achieve lower unit costs. At regional hubs, this oversight may need to extend to the pricing of cross-connects.
- **Cable protection and maintenance.** Once landed, submarine cables may need some form of protective regulatory regime to minimise the risks of damage to the cable, which can cause a loss of connectivity and are costly to repair. This is particularly important for the private cables, which do not have the ability to spread repair costs across many consortium members.
- **Hubs**. The development of regional traffic consolidation points may, over time, help to create sufficient traffic to encourage the large international carriers to build out their own infrastructure further into the region.
- **Institutional capacity development.** Further development of the region's technical knowledge and skills in the key areas of policy, legislation and regulatory frameworks will better enable Pacific island countries to analyse the costs and benefits of available options for international connectivity, make informed decisions; negotiate with partners; manage complex projects; and realize the socio-economic development potential of enhanced access to ICT.

ITU and the Pacific: WTDC-17 and ongoing projects

WTDC-17 : ITU-D OBJECTIVES AND ASIA-PACIFIC REGIONAL INITIATIVES

ITU-D OBJECTIVES 2018-2021

- Foster international cooperation and agreement on telecommunication/ICT development issues
- Modern and secure telecommunication/ ICT Infrastructure: Foster the development of infrastructure and services, including building confidence and security in the use of telecommunications/ICTs
- Enabling environment: Foster an enabling policy, and regulatory environment conducive to sustainable telecommunication/ICT development
- Inclusive digital society: Foster the development and use of telecommunications/ICTs and applications to empower people and societies for sustainable development

ASIA-PACIFIC REGIONAL INITIATIVES 2018-2021

- Addressing special needs of LDCs, SIDs including Pacific island countries and LLDCs
- Harnessing ICTs to support the digital economy and an inclusive digital society
- Fostering development of infrastructure to enhance digital connectivity
- Enabling policy and regulatory environments
- Contributing to secure and resilient environment

ASP RI 1: Special consideration for least developed countries, small island developing states, including Pacific island countries, and landlocked developing countries.

Objective: To provide special assistance to least developed countries (LDCs), small island developing states (SIDS), including Pacific island countries, and landlocked developing countries (LLDCs) in order to meet their priority telecommunication/ICT requirements.

Expected results:

1) Development of policy and regulatory frameworks for broadband infrastructure, ICT applications and cybersecurity, taking into account the special needs of LDCs, SIDS and LLDCs, and strengthening of human capacity to address future policy and regulatory challenges

2) Universal access to telecommunications/ICTs promoted in LDCs, SIDS, and LLDCs

3) Assistance to LDCs, SIDS and LLDCs in adopting telecommunication/ICT applications in disaster management, relating to disaster prediction, preparedness, adaptation, monitoring, mitigation, response, rehabilitation and recovery of telecommunication/ICT networks based on their priority needs

4) Assistance to LDCs, SIDS and LLDCs in their efforts to achieve internationally agreed goals, such as the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction, the Istanbul Plan of Action for LDCs, the Samoa Pathway for SIDS and the Vienna Programme of Action for LLDCs.

Strategic Plan

ITU-D Contribution to the Draft Strategic Plan 2020-2023

OBJECTIVE D.1: Coordination: Foster international cooperation and agreement on telecommunication/ICT development issues

- **D.1-1**: Enhanced review and increased level of agreement on the draft ITU-D contribution to the draft ITU strategic plan, the WTDC Declaration, and the WTDC Action Plan
- **D.1-2**: Assessment of the implementation of the Action Plan and of the WSIS Plan of Action.
- **D.1-3**: Enhanced knowledge- sharing, dialogue and partnership among the ITU membership on telecomm./ICT issues.
- **D.1-4**: Enhanced process and implementation of telecommunication /ICT development projects and regional initiatives.
- **D.1-5**: Facilitation of agreement to cooperate on telecomm./ICT development programmes between Member States, and other stakeholders in the ICT ecosystem, based on requests from ITU Member States involved

OBJECTIVE D.2: Modern and secure telecommunication/ICT Infrastructure: Foster the development of infrastructure and services, including building confidence and security in the use of telecommunications/ICTs

- **D.2-1**: Enhanced capacity of the ITU membership to make available resilient telecommunication/ICT infrastructure and services.
- **D.2-2**: Strengthened Capacity of Member States to effectively share info., find solutions, & respond to cyber threats & develop national cyber security strategies & capabilities.
- **D.2-3**: Strengthened capacity of Member states to use telecomm./ICT for disaster risk reduction and emergency telecommunications.

OBJECTIVE D.3: Enabling Environment: Foster an enabling policy and regulatory environment conducive to sustainable telecommunication/ICT development

- **D.3-1**: Strengthened capacity of Member States to enhance their policy, legal and regulatory frameworks conducive to development of telecomm.ICTs.
- **D3-2**: Strengthened capacity of Member States to produce high-quality, internationally comparable ICT statistics
- **D.3-3**: improved human and institutional capacity of ITU Membership to tap into the full potential of telecomm./ICTs.
- **D.3-4**: Strengthened capacity of ITU Membership to integrate telecomm./ICT innovation in national development agendas

OBJECTIVE D.4: Inclusive Digital Society: Foster the development and use of telecommunications/ICTs and applications to empower people and societies for socioeconomic development and environmental protection

- **D-4-1**: Improved access to and use of telecomm./ICT in LDCs, SIDs and LLDCs and countries with economies in transition.
- **D.4-2**: Improved capacity of ITU Membership to accelerate economic &social dev. by leveraging& using new technologies &telecomm./ICT services & applications
- **D.4-3**: Strengthened capacity of ITU Membership to develop strategies, policies and practices for digital inclusion.
- **D.4-4**:Enhanced capacity of ITU Membership to develop ICT strategies and solutions on climate-change adaptation and mitigation.

Development of Satellite Communications Capacity and Emergency Communications Solutions for

Small Islands Developing States of the Pacific

Focus Areas

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Climate Information

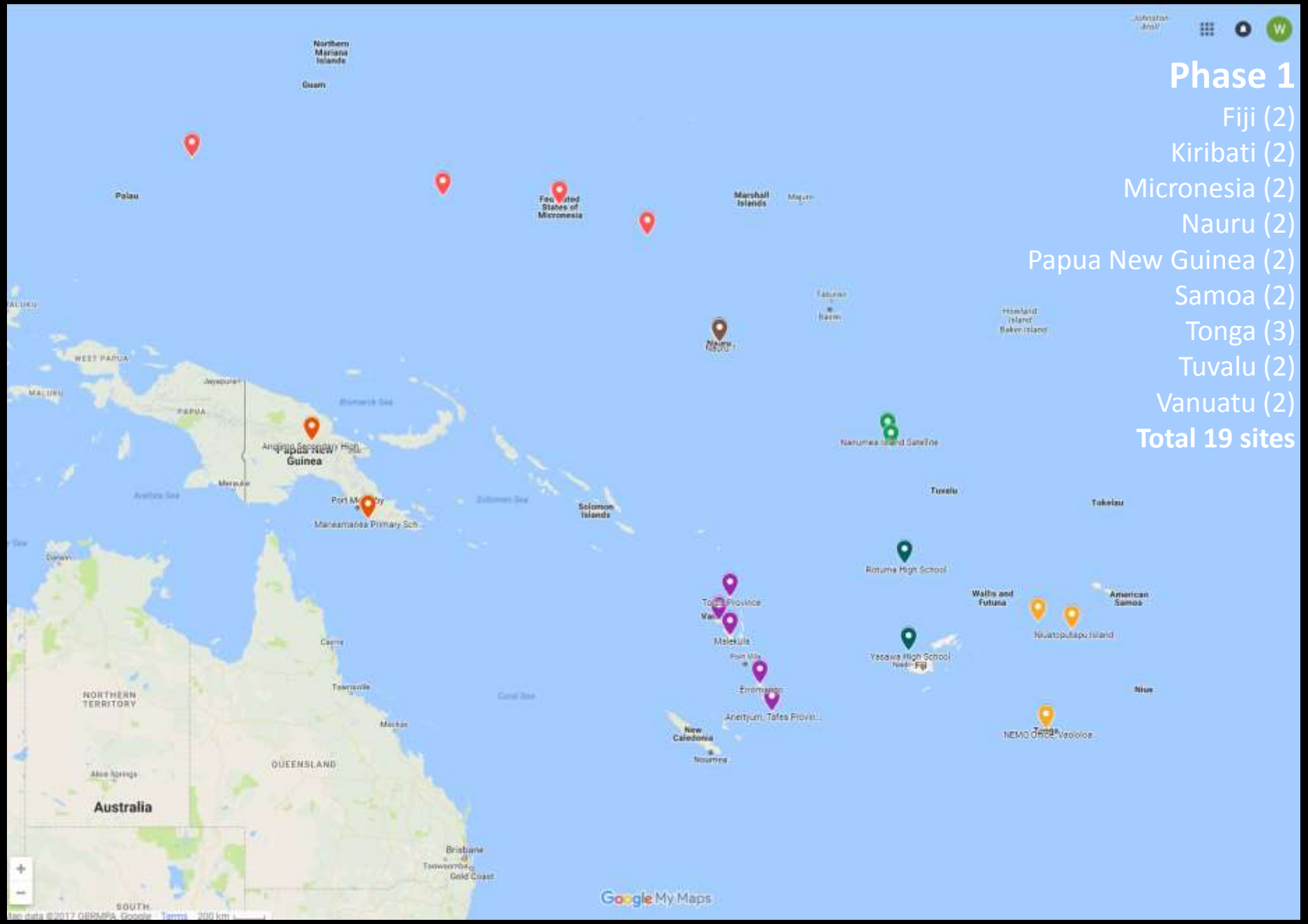
Early Warning and Disaster Response

Health Information

Education

--- --- --- --- --- *capacity building* --- --- --- --- ---

…. more



iDirect Evolution X5

2.4m C-band antenna

ITU-D Projects (2017) examples

E- agriculture

Food and Agriculture Organization of the United Nations

Fiji, Papua New Guinea

National Governments (Ministries of Agriculture, ICT, Regulators)

Spectrum Management

미래창조과학부 Ministry of Science, ICT and Future Planning

Samoa, Fiji

National Governments

Infrastructure Security

Papua New Guinea

ITU – DoCA Projects in the Pacific (2017-2018)

Australian Government
Department of Communications and the Arts

- Implementing Asia-Pacific Regional Initiatives
  (e.g. ITU-PITA Submarine Cable Workshop, PACNOG, ITU-PITA E-application workshop)
- Capacity building on for countering misappropriation of telephone numbers in Pacific Island Countries
- Emergency Telecommunications in Asia and the Pacific
- Cybersecurity in Pacific Island Countries

Cybersecurity in Pacific Island Countries 2018

PROJECT OBJECTIVE

- The objectives of this proposed project are:
- To establish and strengthen of national CIRTS and enhancing coordination, collaboration and information exchange between national CIRTs and with other relevant players;
- To strengthen national cybersecurity policy frameworks that will include assessment and design of national CIRTs from civilian usage perspective;
- To build human and institutional capacity for efficient and effective use of capabilities of CIRTs .

EXPECTED RESULTS

- Stronger coordination, collaboration and information sharing between CIRTS and other relevant players;
- Readiness assessments for national CIRT establishment for selected Pacific Island countries namely Tonga, Samoa, Papua New Guinea and Vanuatu;
- Design and implementation plan for each national CIRT;
- Stocktaking of activities being undertaken in the selected countries by national, regional, and international organisations, and in the region in general; and
- Awareness and hands-on training workshops aimed at building and strengthening human capacity in cybersecurity related matters in general and CIRTs in particular.

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Thank You