

AIIB Digital Infrastructure Strategy

Aug 2020



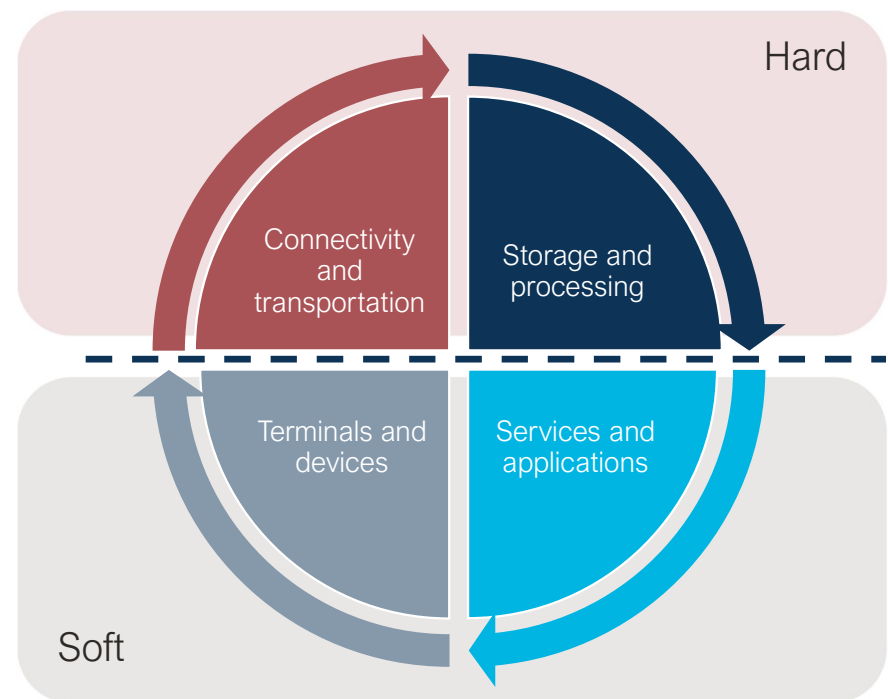
Backgrounds

The Concepts, Market, and Trends



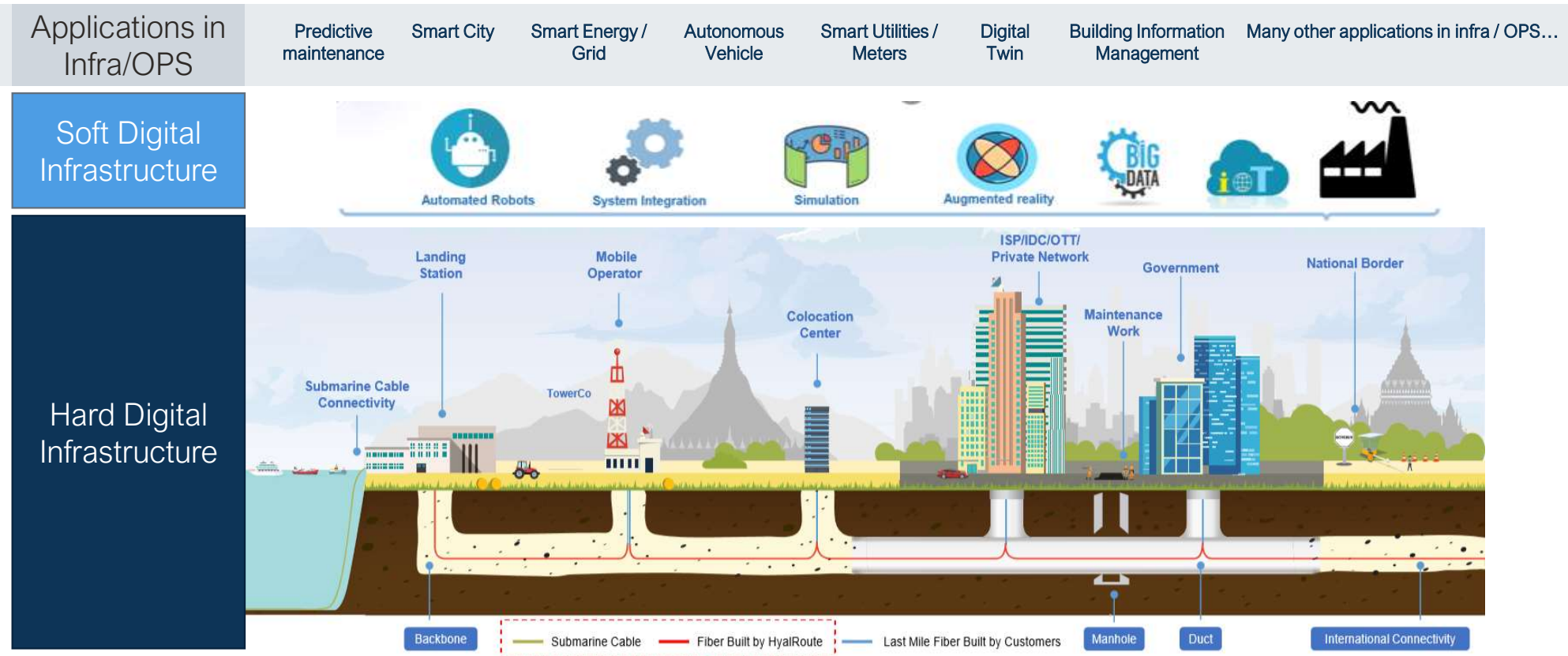
The Digital Infrastructure ecosystem

- Digital Infrastructure is **1 integrated system**
- Digital Infrastructure includes **2 categories**:
(hard) *physical* and (soft) *non-physical*
- Digital Infrastructure contains **4 components** that work interactively
- Digital Infrastructure is the **key foundation and enabler** for the 21st century economy



Digital Infrastructure supports nations full digital development

Just like roads and rails, Digital Infrastructure is the foundation of digital economic activities and technological applications



Source: HyalRoute Group, AIIB

Megatrends and the external environment in which AIIB operates

Three key trends

1. Increasing importance of Digital Economy and emerging financing gap in digital infrastructure

Investments in Digital infrastructure will lag behind the needs, limiting growth

2. Digital divide between countries, regions, demographics and access

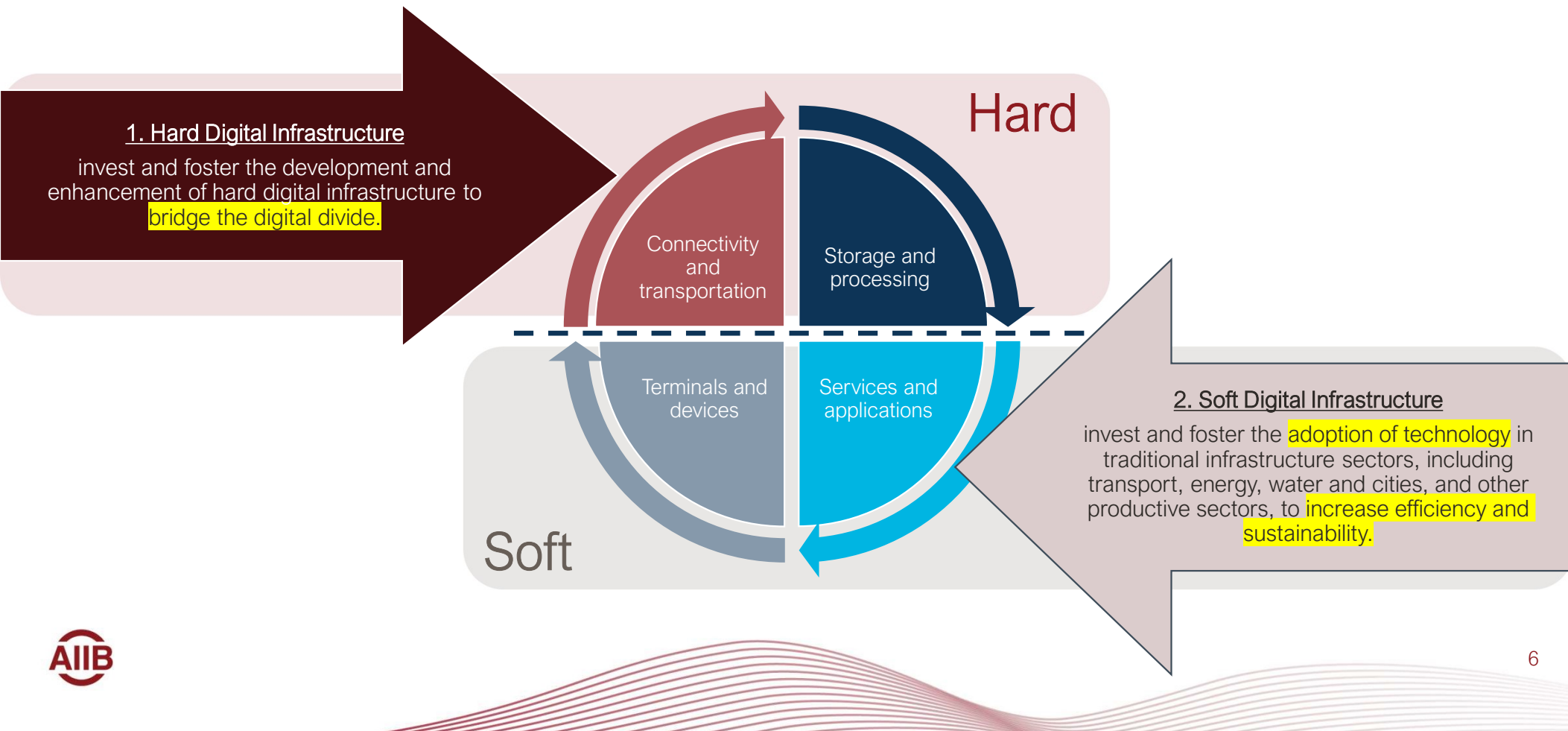
Inequality of capabilities and growth will exacerbate and poorer countries miss the opportunity to 'leapfrog'

3. Divide of technological applications between sectors: infrastructure sectors are lagging

Infrastructure sector will be costly and inefficient to build or maintain, making it less attractive as an asset class and increase debt burdens in the long run

COVID accelerated everything and make digital transformation more thorough and more strategic

2 focuses of AIIB: Digital Infrastructure (DI) for Developmental Impacts (DI)



The digital landscape – key investible sectors

Connectivity and transportation	Storage and processing	Services and applications	Terminals and devices	
The physical infrastructure that carries digital data between devices, data infrastructure and services.	The computing power to run services and storage of data of users.	The functions / applications that create economic value-add to business sectors and customers.	The interfaces between users (human or machines) and the digital services and applications.	
<div>Shared infrastructure companies ("Infracos")</div> <div></div>	<div>Telecom/Internet Service ("Telcos")</div> <div></div>	<div>Data centers and cloud services</div> <div></div>	<div>Digital services and applications</div> <div></div>	<div>Devices and terminals</div> <div></div>

Sources: AIIB analysis, Ovum

Hard Digital Infrastructure

Develop the infrastructure that is foundational to digital economy



Summary of financing landscape: investment needs / gaps by different institutions

Analyses consistently point to an emerging Digital Infrastructure funding gap for Asia

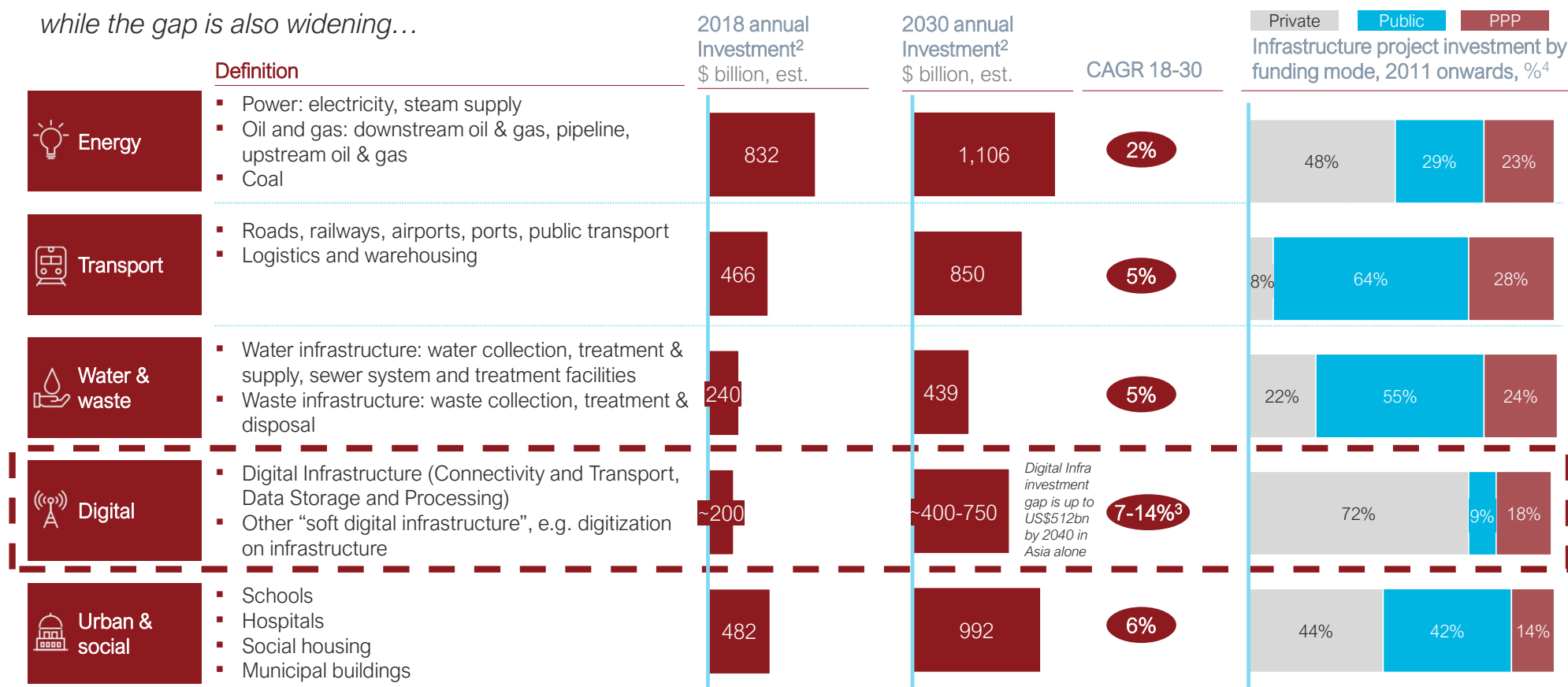
Institutions	Datasets	Definitions	Investment Needs		Investment Gaps		Funding Source	Remarks
			2018 (USDbn)	2030 (USDbn)	2018 (USDbn)	2030 (USDbn)		
1. AIIB and McKinsey in-house analysis	-McKinsey IPAT (2011 onwards), -Expert interviews, IHS Markit ICT (Ovum), IDC, Gartner, etc.	1. Connectivity - Yes 2. Storage - Yes 3. Devices - only related to infra 4. Applications - only related to infra	USD207bn (of which USD127bn is connectivity)	Up to USD500bn (at least USD200bn from connectivity)	N/A	N/A	-Private 72% -PPP 18% -Public 9%	- Private is dominating - PPP is increasing
2. Ovum	Ovum CSP Capex Tracker and other capex datasets	1. Connectivity - Yes 2. Storage - Yes (datacenter only) 3. Devices - No 4. Applications - No	USD193bn	USD369bn	N/A	USD131bn	N/A	- Need forecast based on growing current capex to match projected economic growth. - Gap is the difference between projected need minus projected operator capacity for investment (based on Ovum revenue growth forecast).
3. ADB	ADB's own study	1. Connectivity - Yes 2. Storage - No 3. Devices - No 4. Applications - No	USD112bn	USD218bn	USD46bn	USD85bn (connectivity only)	N/A	- Weak in PPP - Private finance is increasing - Identify investment gap to address climate change related issues
4. World Economic Forum ("WEF")	World Bank, ADB, Global Infrastructure Outlook, Oxford Economics	1. Connectivity - Yes 2. Storage - Yes 3. Devices - No 4. Applications - No	N/A	N/A	USD14bn	USD241bn	- Private sector dominant	- The gap will rise up to USD512B (in 2040) - Focused at connectivity and Internet-based infra - Prevalent in middle to low income countries - Little investment in advanced digital infra and infra-tech

Source: AIIB, IJGlobal (2001-2019) datasets, WEF, OECD, World Bank, ADB, IFC, ITU, McKinsey IPAT, Ovum CSP Tracker, IHS Markit ICT (now Ovum), IDC, Gartner

See appendix (p.11 for more detailed sub-sector analysis)

Digital Infrastructure annual investment is on the rise

while the gap is also widening...



1 Investment data excludes waste infrastructure, municipal buildings, social housing; data center and “soft digital infrastructure” are high-level estimation (due to limited data availability)

2 Includes data on 24 out of the 44 AIIB regional members due to limited data availability; countries with missing data include: Iran, Afghanistan, Azerbaijan, Brunei Darussalam, Cambodia, Cyprus, Fiji, Georgia, Kazakhstan, Kyrgyz Republic, Lao PDR, Maldives, Mongolia, Myanmar, Nepal, Samoa, Tajikistan, Timor-Leste, Uzbekistan, Vanuatu

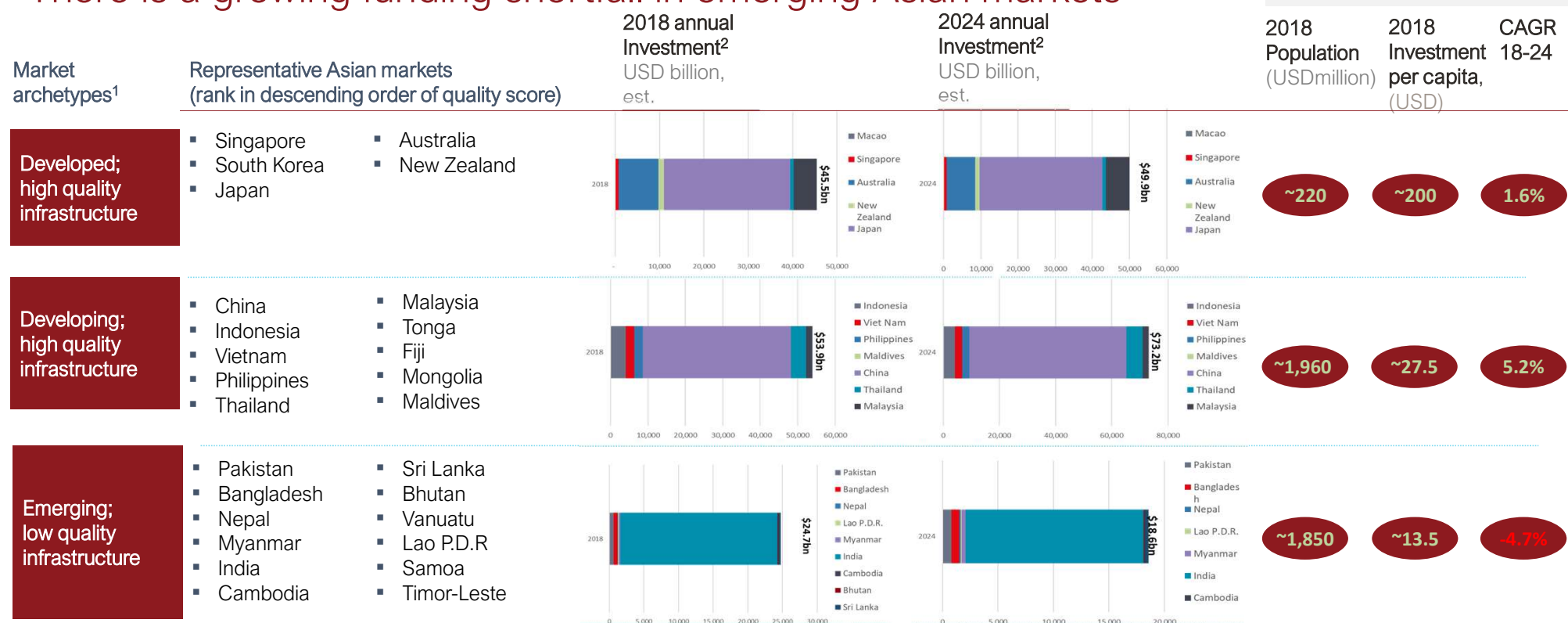
3 Qualitative directional indication

4 Project-level data financing documented by McKinsey Infrastructure Project Analytics Tool (IPAT) database; excludes non-project financing; uses expected funding mode

SOURCE: AIIB; McKinsey; WEF; IHS Markit / Global Insight; International Transport Forum (OECD); MEED; Global Water Institute; local country sources

There is a growing funding shortfall in emerging Asian markets

Source: ITU; Ovum; local country sources



1 Developed / developing / emerging and least developed categorized by ITU classification based on the **ICT Index**; High / low quality defined by WEF Global Competitiveness Report; High / low quality defined by WEF Global Competitiveness Report: pillar 2 (**infrastructure** – 80% weight) and pillar 3 (**ICT adoption** – 20% weight); score above 70 (on a scale of 0-100) is defined as high quality infrastructure

2 Includes data on 24 out of the 55 Asian markets due to limited data availability; countries with missing data include: Pacific Islands; Afghanistan, Mongolia, and few Eurasian markets.

Asian markets are at different stages and have different infrastructure priorities

Key features	Emerging (e.g. India, Myanmar, Afghanistan, Bangladesh)	Developing (e.g. Indonesia, Philippines, Malaysia, Kazakhstan)	Developed (e.g. Singapore, Japan, South Korea)
Policy	National broadband plans are high level only. Mobile technologies are the policy focus.	National broadband plans are clearer, but only Malaysia has seen effective public investment	Government has encouraged mass fixed broadband rollout by private investors
Connectivity	Mobile coverage is expanding but fixed broadband is neglected. International connectivity is limited.	Focus is on universal mobile coverage and urban fixed broadband coverage	Focus on superfast broadband with national coverage targets.
Data center	Not a current policy priority. Limited data infrastructure and inadequate international connectivity.	Efforts to attract data infrastructure investment to support economic growth.	Data infrastructure extensively used to collect and synthesize information for policy making and business.
Investment priorities	Capital for mobile coverage is the priority.	Upgraded mobile network, fixed broadband, and data infrastructure are priorities.	Infrastructure spinoffs and sharing will grow, driven by business needs and regulation.

Financing landscape – uses of funding

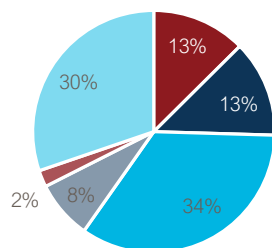
A preliminary overview of the types of Digital Infrastructure transactions

1. The preliminary analysis is done on 242 Digital Infrastructure transactions in Asia and AIIB member countries, from IJGlobal between 2001-2019
2. This is an incomplete dataset reflecting the total financing landscape as many capital expenditure is financed by internal cashflows of the corporates or equity/debt finance raised at the corporate level (hence, no explicit transaction records on each project).
3. According to the latest report, IFC has a Digital Infrastructure portfolio of USD1.5bn over 67 projects globally (~75% in mobile and towers)

Finance Type	No. Transactions	% of Total	Transaction Value (USDm)	% of Total
Corporate Finance	96	40%	69,274	35%
Project Finance	131	54%	122,275	62%
Sovereign/Sovereign Guarantee	15	6%	5,120	3%
Total	242	100%	196,669	100%

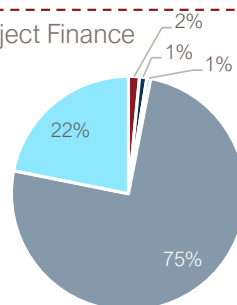
Types of Corporate Finance

■ Additional Facility
 ■ Asset Acquisition
 ■ Company acquisition
 ■ Primary Financing
 ■ Privatisation
 ■ Refinancing

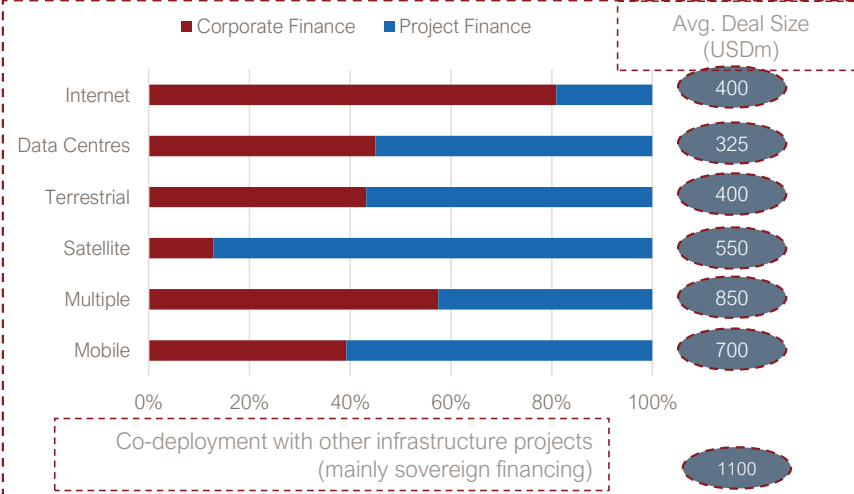
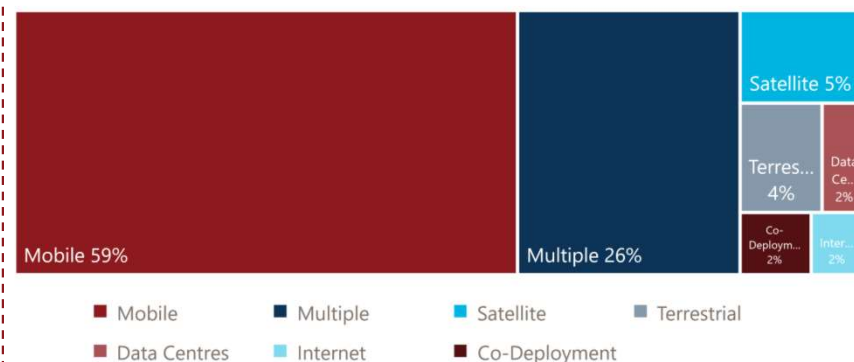


Types of Project Finance

■ Additional Facility
 ■ Asset Acquisition
 ■ Portfolio Financing
 ■ Primary Financing
 ■ Refinancing



Transaction analysis by subsectors



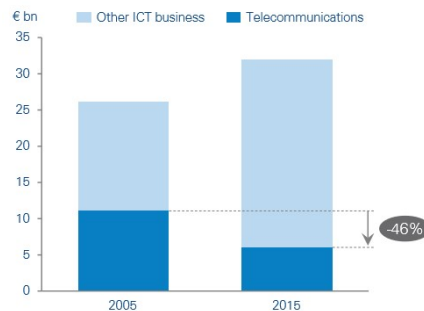
Digital Infrastructure investment needs are rising, but the main current funders are facing declining revenues and investment capacity

- In recent years, telecommunications has been under pressure from significant declines in sales, coupled with new investment requirements in 5G and fiber.
 - Between 2005 and 2015, telecommunications providers' revenues almost halved (a 46% drop, for example, in Austria).
 - Gross capital formation fell by 13% over this period, lifting capital intensity.
- The telecommunications industry – which is the main funder of 5G, fiber expansion, and other Digital Infrastructure developments – cannot independently raise the financial resources needed for network expansion over the next decade.

As a result, the funding needed to achieve development goals will not be met solely by digital operator investment. There is a Digital Infrastructure investment gap.

1. Share of annual income by Telecommunications players vs. other ICT businesses (downstream digital services) in selected countries in Europe

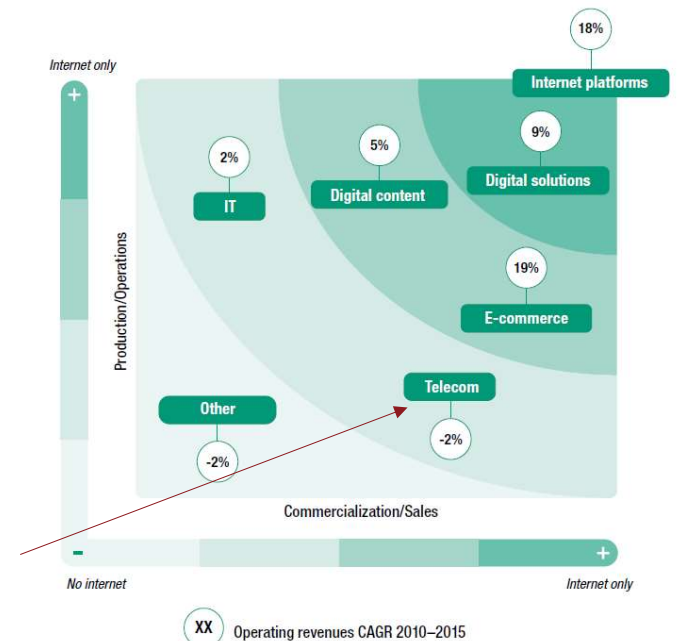
Source: ADL



2. Ever-increasing usage but decreasing revenue is limiting financial capacity to fund future CAPEX by the industry (currently the main funder).

Although Digital solutions, ecommerce, and digital content achieved 9-19% CAGR in revenue over 2010-15, telcos actually experienced a drop in revenue of around 2% globally due to competition, commoditization and consequent lower tariffs

Source: UNCTAD



Source: ©UNCTAD, based on UNCTAD's FDI/MNE database, company reports and data from Orbis BvD and Thomson ONE.
 Note: Positioning in the internet intensity matrix is indicative and based on a qualitative assessment. The categories "Internet platforms", "Digital solutions", "E-commerce" and "Digital content" include 92 companies (of which 10 internet platforms, 14 e-commerce, 23 digital solutions and 45 digital content) from UNCTAD's ranking of the top 100 digital MNEs. The categories "IT" and "Telecom" include 92 companies (of which 66 IT and 26 telecom) from UNCTAD's ranking of the top 100 ICT MNEs. The category "Other" includes 80 companies operating in non-ICT industries from UNCTAD's overall list of the top 100 MNEs.

Key takeaways on Digital Infrastructure financing

1

MDBs could be a leader in this market. Digital divide, rising Digital Infrastructure gap, weakening financial capabilities for Digital Infrastructure of the industry, are all contributing to opportunities for AIIB's involvement.

2

The industry and corporates are the main funding sources for Digital Infrastructure development, despite their increasing pressures of financial performances. Digital Infrastructure is still not yet mainstream for financial investors

3

While it is core to Digital Infrastructure, private capital alone does not solve every problem of the digital divide and financing gap. However, **MDB commitment in this sector is very low** despite the rise of digital divide and acknowledgement among the MDBs themselves that this is an increasingly impactful sector.

4

The increasing Digital Infrastructure financing gap in Asia calls for new sources of financing: from institutional / financial investors, or creating and spin-off of Digital Infrastructure assets into shared “Infraco” or investment trust to reduce repetitive capex

Soft Digital Infrastructure

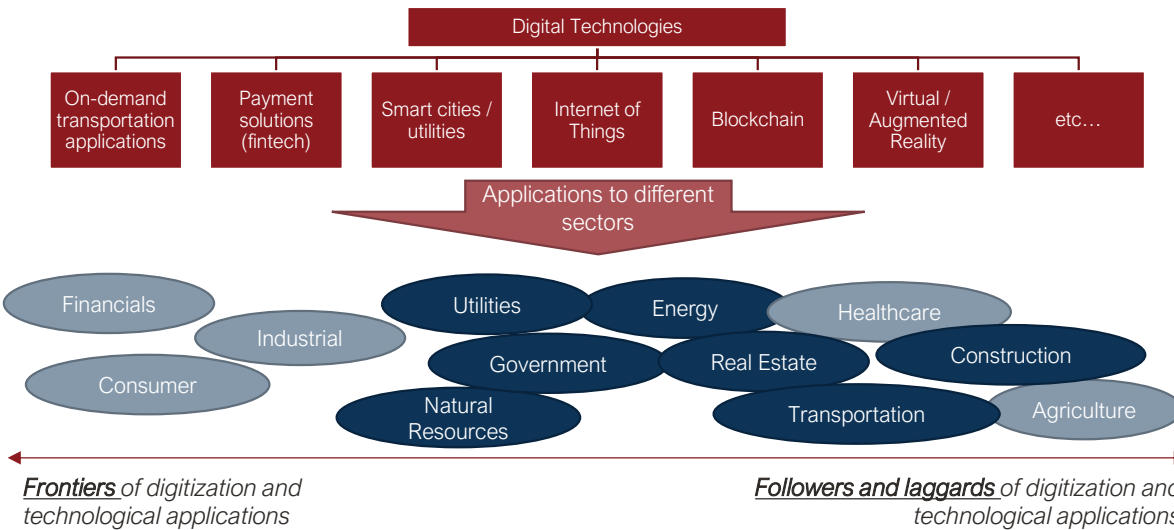
Applying digital technologies to improve all traditional infrastructure sectors



Digital Technologies can create tremendous value to the economy

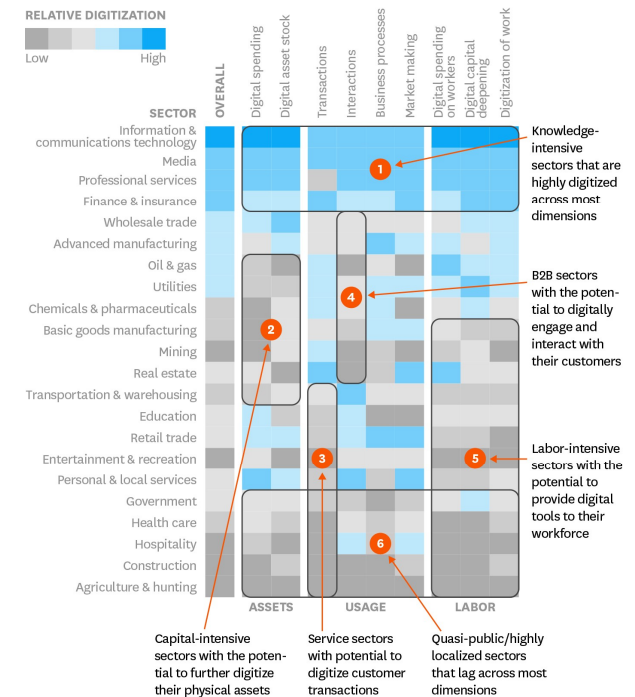
Digital technologies impact all sectors, but some sectors are more advanced while others like infrastructure construction is lagging behind

- Digital technologies provide **both transformative and progressive opportunities** to all sectors. (E.g. fintech, e-commerce, on-demand transportation, etc.)
- The emergence of technology also evolves and blurs the traditional way of understanding different sectors. (is Grab/Gojek/Uber a tech company or transportation company?)
- However, not all sectors see the same level of developments; construction and infrastructure-enabling technologies are not as popular as the others for investments/applications due to the quasi-public/highly localized sector dynamics.



How Digitally Advanced Is Your Sector?

An analysis of digital assets, usage, and labor.



SOURCE: DATA ANALYSIS AND EXPERT INTERVIEWS CONDUCTED BY THE MCKINSEY GLOBAL INSTITUTE

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Why Infrastructure Technology (“Infratech”)?

What the infrastructure market stakeholders say?

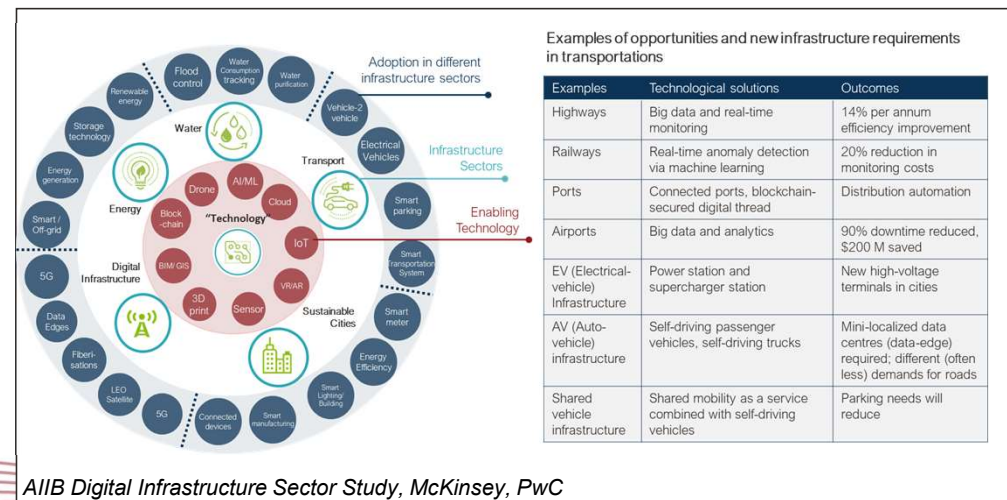
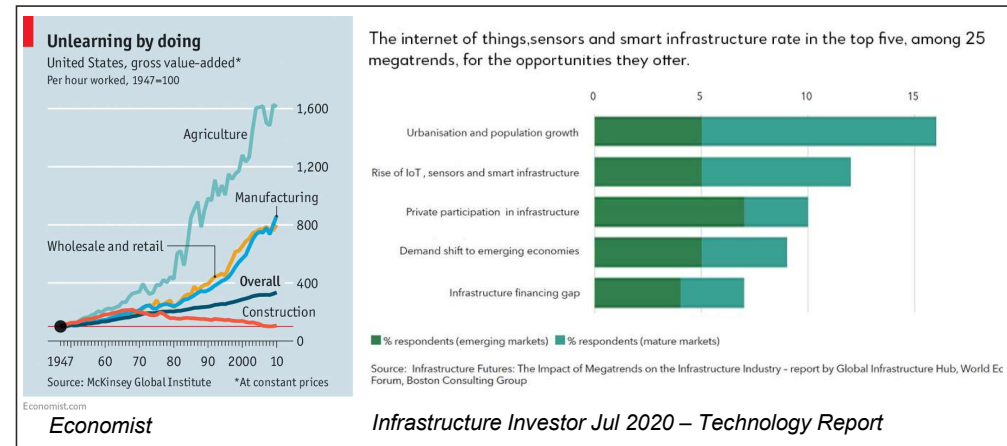
- ◆ Construction sector is the only one that lags in terms of productivity growth; many infrastructure sectors
- ◆ Only 16% of respondents believe the infrastructure industry is evolving fast enough to meet society’s changing needs
- ◆ Better technology will reduce costs, waste and also improve sustainability

Why should we care: Transformative impacts and progressive opportunities

- ◆ More upsides: Infrastructure is treated as a passive income generating asset, technology might change that
- ◆ More downsides: Infrastructure and related sectors are not so safe anymore and do face disruption risks
- ◆ Predictive maintenance, digital twin and other technologies can [provide incremental opex saving up to 25% and improve performance](#) which improve asset return
- ◆ [Digitalization within the power sector](#) has the potential to save around USD80 billion per year globally, or about 5 percent of total annual power generation costs.

What the challenges?

- ◆ Top-down planning and restrictive procurement arrangements
- ◆ lack of value capture in related economic activities of the infrastructure
- ◆ Treat infrastructure as passive, stable income-generating assets
- ◆ Lack of industry dialogue and partnerships
- ◆ Talent pool and culture



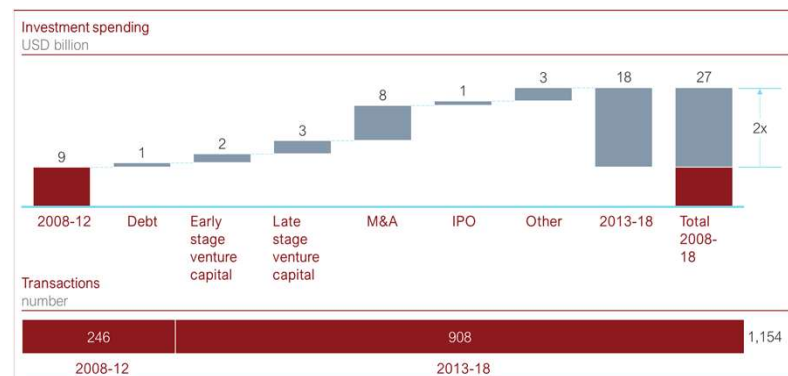
What are the solutions and AIIB's approach?

What can be done?

- ◆ Top-down planning and restrictive procurement arrangements
- ◆ Promote collaboration and reduce frictions.
- ◆ Find ways to properly structure and layer infrastructure.
- ◆ Create experimental test beds and a fertile enabling ecosystem.
- ◆ Create attractions and incentives for the right talents.
- ◆ Take advantage of windows of opportunity for change.

AIIB's approach

- ◆ **Industry Engagement:** Connecting infra / tech companies and foster partnerships
- ◆ **Knowledge Leadership:** Mapping technologies, identifying opportunities
- ◆ **Infratech investments:** Investing into funds / platforms that focus on infrastructure-related technologies
- ◆ **Smart Infrastructure Investments:** Investing into projects and provide facilities for technology components
- ◆ **Ecosystem building:** Develop better innovation ecosystem: roundtables, exhibitions, incubators
- ◆ **International Collaboration:** Working with international organizations to set agenda, have policy dialogues, discuss regulatory framework



Investment opportunities in infrastructure digitization (construction phase)

AIIB, McKinsey, Pitchbook Data

New digital applications are emerging in all infrastructure sectors

And digitalization is creating new targets for investment that cross traditional infrastructure sector boundaries

	Power & Energy	Transport	Water	Smart cities
Productivity opportunities	<ul style="list-style-type: none"> Smart meters Smart grids and smart load management Gas leak detection Fuel efficiency Predictive maintenance Grid outage response automation 	<ul style="list-style-type: none"> Intelligent traffic lights Real-time road navigation Public transit information and management Digital public transit payment Dynamic speed limits AV/remote control centers Driverless trains & trucks Predictive maintenance 	<ul style="list-style-type: none"> Water quality monitoring Water storage monitoring Leakage detection and control Predictive maintenance 	<ul style="list-style-type: none"> Real-time air quality information Smart streetlights Smart bins Waste collection route optimization
Progressive and incremental opportunities	<ul style="list-style-type: none"> Dynamic wholesale and retail pricing Energy storage management Industry structural reform & markets for local generation "Digital twin" simulation for generation and grid New structural arrangements to promote competition Digital construction practices 	<ul style="list-style-type: none"> Dynamic smart parking Dynamic congestion pricing Shared and autonomous riding Mobility as a service (multimodal public transit) "Digital twin" for transport simulation and management Digital construction practices 	<ul style="list-style-type: none"> Behavior-based water consumption tracking and pricing Long and short term water market trading Smart drainage & stormwater management for grey water recycling "Digital twin" simulation for extreme events prediction Digital construction practices 	<ul style="list-style-type: none"> Digital tracking and payment for waste disposal Building energy management systems and dynamic pricing Home energy consumption tracking and environmental services "Digital twin" city simulation New structural arrangements to promote third-party access to city data for applications development Digital construction practices
Transformation opportunities				
New investment targets	Datacenters and cloud services providers, Big data platform providers, AI-based analytics providers, IoT and sensor platform providers, Blockchain and cybersecurity platform providers			



AIIB, McKinsey, Pitchbook Data

infraVia Growth Fund and hired three new team members with backgrounds in growth equity and VC – target EUR300m

Focusing on technology that improve climate resilience of different sectors like energy, transport and etc.

OTPP sets up incubator for healthcare, utilities and transportation.

Has a digital team dedicated for new technologies to infrastructure

Clearvision is a venture firm focusing on Infratech based in Silicon Valley

Transforming Infrastructure: Frameworks for Bringing the Fourth Industrial Revolution to Infrastructure

G20 Riyadh InfraTech Agenda

A dedicated department to look at emerging technologies and applications to create value for portfolio



What does technology mean for AIIB?

- 1 Technology is a broad space and impactful in many ways, **finding the right strategic focus** within technologies is essential to maximize financial and strategic impacts of the Bank (infrastructure is our core mandate and **infrastructure-enabling technologies** (“infra-tech”) **could be a focus**).
- 2 Infrastructure investors should be aware of **transformative changes** brought by technology innovation to seize emerging opportunities (investment thesis) and avoid investing in stranded assets (risk management).
- 3 There are **progressive value-adds** and opportunities from technologies that could be readily incorporated in existing infrastructure sectors and improve efficiency (portfolio value creation) and E&S performances (sustainability).
- 4 Most **MDBs are aware of the importance** of technology and digital components for development and are developing different facilities / initiatives to support.
- 5 AIIB needs to **be measurably agile and innovative** to become a 21st century development bank for infrastructure – technology and innovation is an important cross-cutting priority for clients/projects, as well as drivers for internal efficiency.

Annex: What are other MDB peers doing in Digital?

Challenges for public sectors: MDBs have low commitments in Digital Infrastructure, despite recognizing its importance



Based on data from 9 MDBs (IBRD, IDA, IFC, AFDB, ADB, IaDB, EIB, AIIB and NDB);
Sources: MDBs, Xalam Analytics Research

1. Most institutions believe the proportion of investments into Digital Infrastructure will increase and think that digital integration in traditional infrastructure projects is a key step to increase digital investment share of MDB and impacts of commitment.
2. Despite the increasing importance, MDB's commitment to the digital sector is very low. Just 1% of MDB commitments are in digital projects. The last ICT strategy by ADB, for example, was done in November 2003.
3. Investment in the digital sector is perceived as a private sector activity — this is fostering a “middle class-centric” view of digital markets, whereby capital investments are primarily focused on the needs of the growing urban middle class, leading to a deepening of the digital divide, between rich and poor countries and between urban and rural areas.

Key recommendations from the World Wide Web Foundation and Alliance for affordable internet:

- Change the investment narrative within and outside of MDBs to re-establish the ICT sector as a priority.
- Develop innovative financing solutions for rural area projects.
- Increase investments in the development of enabling policy frameworks.

Source: World Wide Web Foundation, Alliance for affordable internet

What do other MDBs do in applying soft Digital Infrastructure in development work?

Most MDBs agree and realize the importance of digital technology to infrastructure

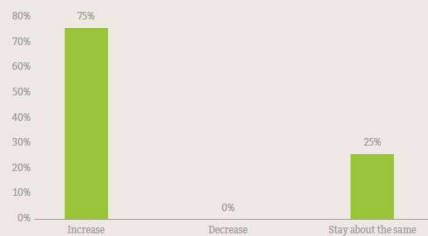
All MDBs have expressed the importance of digital technologies and set up dedicated units, funds, facilities, initiatives, events or publications to raise the awareness and facilitate adaptations of technologies and innovations for development and infrastructure.

- World Bank have set up **Digital Development Program (DDP)** and **InfoDev**.
- ADB has set up the **Digital Technology for Development Unit** in March 2018, held ADB Digital Development Forum and set up **ADB Venture Facilities**.
- IFC has a dedicated **Venture Capital team** focusing on cleantech, fintech and etc. (with 20+ investment professionals, portfolio of ~USD500m)
- IFC AMC published an article and recommended investors should actively cultivate an innovation network to stay abreast of new developments.

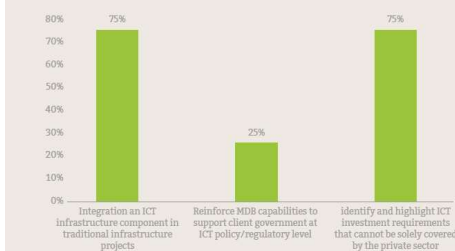
What do other MDBs think about technology?

- 75% of MDB expects the proportion of **investments in ICT** will increase.
- 75% of MDBs believe that **integration of ICT component in traditional infrastructure projects** is the key to increase impact of MDB's commitments.

In the next two years, you expect the proportion (%) of your institution's investments that is allocated to the ICT sector to:



What type of steps/actions can be taken to increase ICT share of MDB infrastructure investments and/or the impact of MDB commitments in the ICT sector?



Infrastructure disrupted: investing in the age of 'unknown unknowns'

Viktor Kats, co-fund head of the IFC Global Infrastructure Fund, and Deepali Bahl, principal at the fund, argue investors need structured frameworks to be able to deal with the impact of technology

THE CHANGING NATURE OF INFRASTRUCTURE ASSETS

The case for decreased road demand

- Shared vehicle business models will drive down car ownership
- AVs will result in greater efficiency and less traffic
- Drone taxis and other new technologies (e.g., Hyperloop) will eat into the passenger and cargo market

Will the demand for road infrastructure increase over the next 20 years?

The case for increased road demand

- Car penetration will rise as the cost of car ownership comes down
- Traffic will rise as people are able to move about with more ease and efficiency
- New technologies will take time to win public confidence and become cost-competitive



Sources: IFC

ADB Ventures

Investment Fund I:

Seed to Series A equity and quasi-equity investments of \$100k to \$4 million, co-invested with the private sector.

ADB Ventures Technical Assistance Fund:

Source potential investments, pilot solutions, and support local innovation ecosystems.

DIGITAL DEVELOPMENT PARTNERSHIP

TECH EMERGE

IFC
International Finance Corporation
WORLD BANK GROUP

infoDev
INNOVATION & ENTREPRENEURSHIP



Sources: World Wide Web Foundation, Alliance for Affordable Internet