

# EBRD's Approach to ICT Infrastructure Development

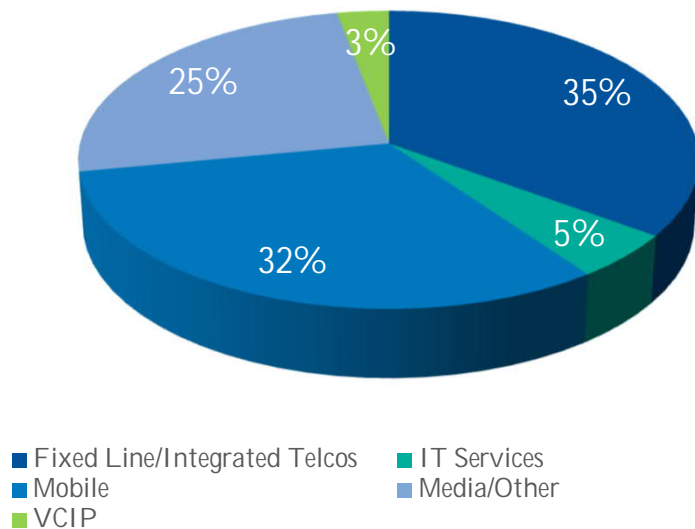
May 2019



# EBRD: ICT Team

- Cumulative financing to date: € 4.3 billion
- Current portfolio: € 1 billion
- 187 deals ranging from a few million to over €200 million in 36 countries

ICT Portfolio volume by sector TBU



## Selected Subsectors

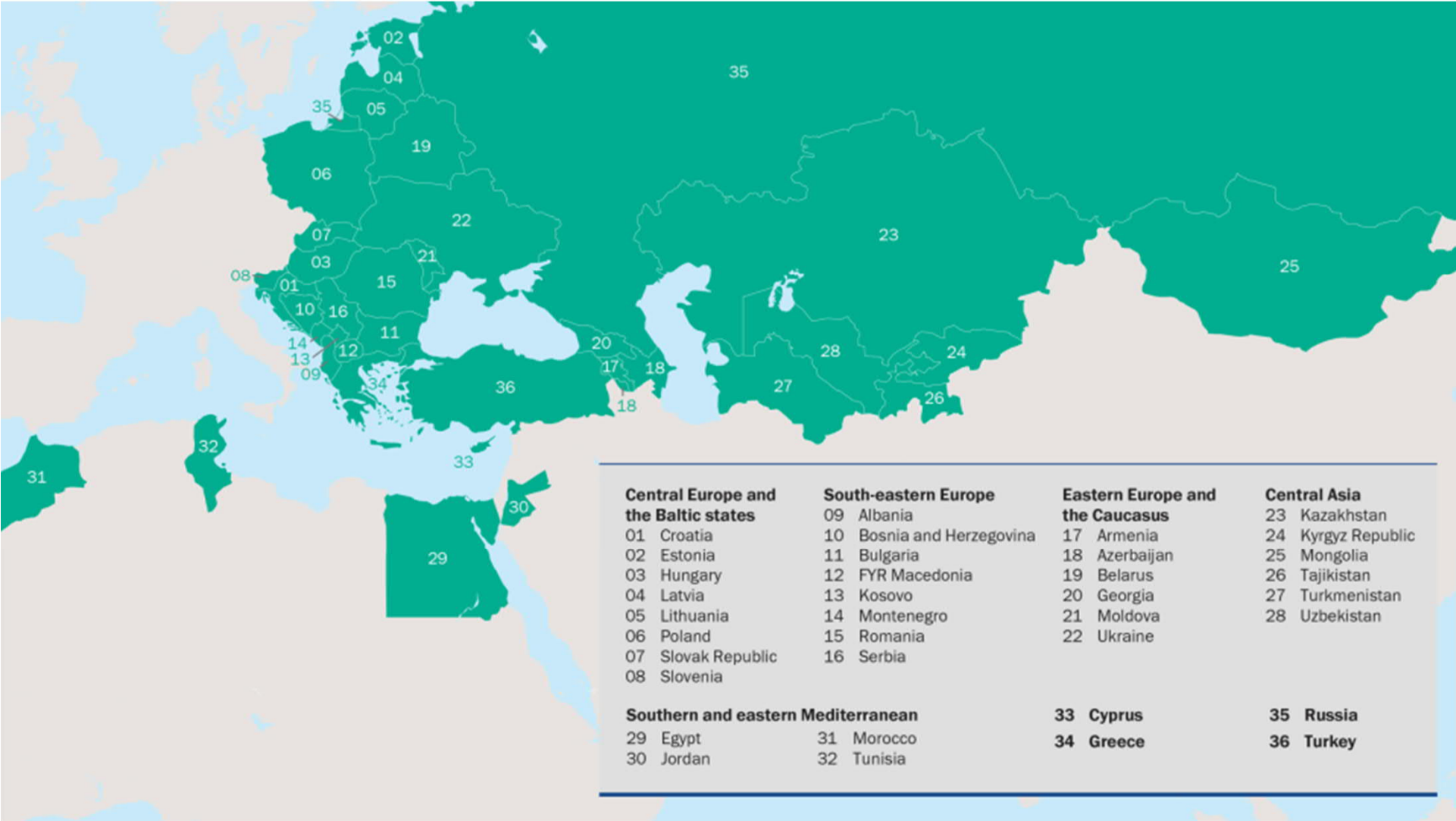
- Mobile & fixed line
- Cable TV
- Towers
- Satellites
- Fibre
- Wireless broadband
- Data centers
- MVNO
- Pay-Tv
- Mobile payments
- IT services
- Digital Switch Over
- Software
- Outsourcing
- Systems integrators
- Call centers
- Outdoor advertising
- Internet
- Cleantech
- Smart City

Venture Capital Investment Programme: Dedicated €200 million capital pool investing early as well as growth stage venture capital in innovative, high-growth technology companies from central Europe to central Asia

# EBRD: Where we invest



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# ICT Infrastructure Financing: Successful Examples

## Broadband development in rural areas in Greece

- Project implemented as PPP, divided into three lots, with tender for each
- PPP to be operational for 17 years, with public authority keeping ownership of infrastructure
- Fiber technology selected as the most suited for high-speed broadband services

Results: Project covered 45% of Greece with fiber network, providing connectivity to over 5,000 villages with population of over 500,000

### Lessons and recommendations

- Stakeholder cooperation essential, with regional and local level involvement
- Closing the rural-urban digital divide contributes to improvement of quality of life

# Background on the Digital Agenda for WB

## Background

July 2017 : Broadband connectivity introduced in the Digital Agenda for the Western Balkans


December 2017 : WBIF eligibility extended to digital / ICT infrastructure

- To support:
  - Analysing the broadband needs and gaps
  - Supporting rollout of broadband networks to bridge infrastructure gaps
  
- Preparation of a project pipeline
  1. Rural Broadband Development
  2. Digital Broadway Highway

# EBRD's Approach and Knowledge Economy Initiative



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The "knowledge economy" (KE) is a concept of economic development, in which innovation and access to information drive productivity growth.

Innovation enables production of better-quality goods and services while consuming fewer natural resources and enabling more efficient use of human resources.

...an integral part of the EBRD's transition mandate.

Knowledge Economy Initiative focuses on:

- improving companies' competitiveness and position in the global value chains
- further developing access to information
- promoting and supporting the ability of traditional industries to innovate
- helping ensure the continuity

# Knowledge Economy Index



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Structure of the EBRD Knowledge Economy Index				
Pillar	Institutions for innovation	Skills for innovation	Innovation system	ICT infrastructure
Dimensions	Economic openness	General skills	Inputs	ICT availability
	Business environment		Outputs	
	Governance	Specialised skills	Linkages	ICT sophistication

KE Index contains 38 indicators organized methodology is composed of 4 key pillars, each divided into several dimensions:

- Institutions: Strong property rights, rule of law, proper innovation policies
- Skills: inadequately trained workforce poses barriers to knowledge transfers and technological upgrading
- Innovation system: network of innovation players, available resources and interactions. Inputs (R&D spending) and outputs (patents) linked through science-industry collaboration, venture capital and value chains.
- ICT infrastructure: Broadband speed and penetration

# ICT Infrastructure Dimensions



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## ICT availability

- Broadband subscriptions per 100 inhabitants
- Active mobile broadband subscriptions per 100 inhabitants

## ICT sophistication

- International internet bandwidth per internet user (bit/second)
- E-Participation Index
- Online Service Index



ICT sophistication increases by developing e-Government capabilities.

## Example Estonia

'The most advanced digital society in the world', Estonia has built the 'X-Road', a data platform allowing services such as:

- electronic voting
- establishing a company in minutes
- access to all public services
- medical personnel immediate access to records



# e-Estonia at a glance



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## e-governance

99% of public services are available to citizens as e-services.

- Government Cloud
- i-Voting
- e-Cabinet



## mobility services

self-driven vehicles allowed on public roads since 2017

- Intelligent Transportation Systems
- Mobile Parking
- Border Queue Management



## business and finance

establish a company in Estonia just in 18 minutes

- e-Tax
- e-Banking
- e-Business Register



## education

twice as many students pursue IT careers in Estonia in other OECD countries

- Estonian Education Information System
- eKool and Studium
- e-Schoolbag



## e-identity

more digital signatures have been used in Estonia than in the rest of the European Union altogether



## interoperability services

X-Road saves over 1400 years of working time for Estonia every year

- X-Road
- e-Land Register
- Population Registry



## security and safety

KSI (scalable blockchain technology) invented in Estonia

- KSI Blockchain
- e-Law
- e-Justice
- e-Police



## healthcare

Estonia uses blockchain technology to ensure healthcare data security

- e-Health Records
- e-Ambulance
- e-Prescription

# e-Government Trends



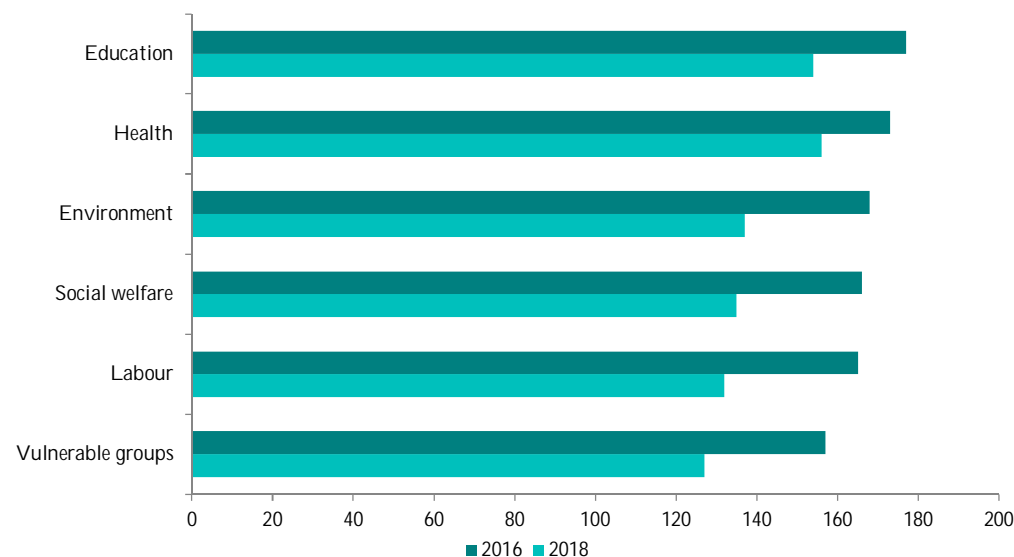
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UN's e-participation framework:

- (i) e-information
- (ii) e-consultation
- (iii) e-decision making

Trends in transactional online services					
Trends of transactional services online, 2014, 2016 and 2018	2014	2015	2018	Increase in percent of countries offering the service	
				2016 to 2018	2014 to 2018
Pay for utilities	41	104	140	26%	71%
Submit income taxes	73	114	139	18%	47%
Register a business	60	97	126	23%	52%
Pay fines	42	76	111	32%	62%
Apply for a birth certificate	44	55	86	36%	49%
Apply for a marriage certificate	39	53	82	35%	52%
Register a motor vehicle	33	47	76	38%	57%
Apply for drivers licence	29	38	62	39%	53%
Apply for personal identity card	27	31	59	47%	54%

Number of countries offering archived information in 2016 and 2018, by sector



- e-information: making all information available
- e-consultation: allowing citizens decisions on public policies and services
- e-decision making: including citizens in co-creation of public policies and services

# KE Cluster Analysis and WB

EBRD identified three stages of KE in the EBRD regions:

- The early KE group: weak institutions and innovation skills, poor ICT infrastructure
- The intermediate KE group: stronger innovation institutions for innovation and better ICT infrastructure, but weak innovation skills
- The advanced KE group: favourable institutions for innovation and ICT infrastructure, but innovation skills and of innovation system efficiency behind OECD average

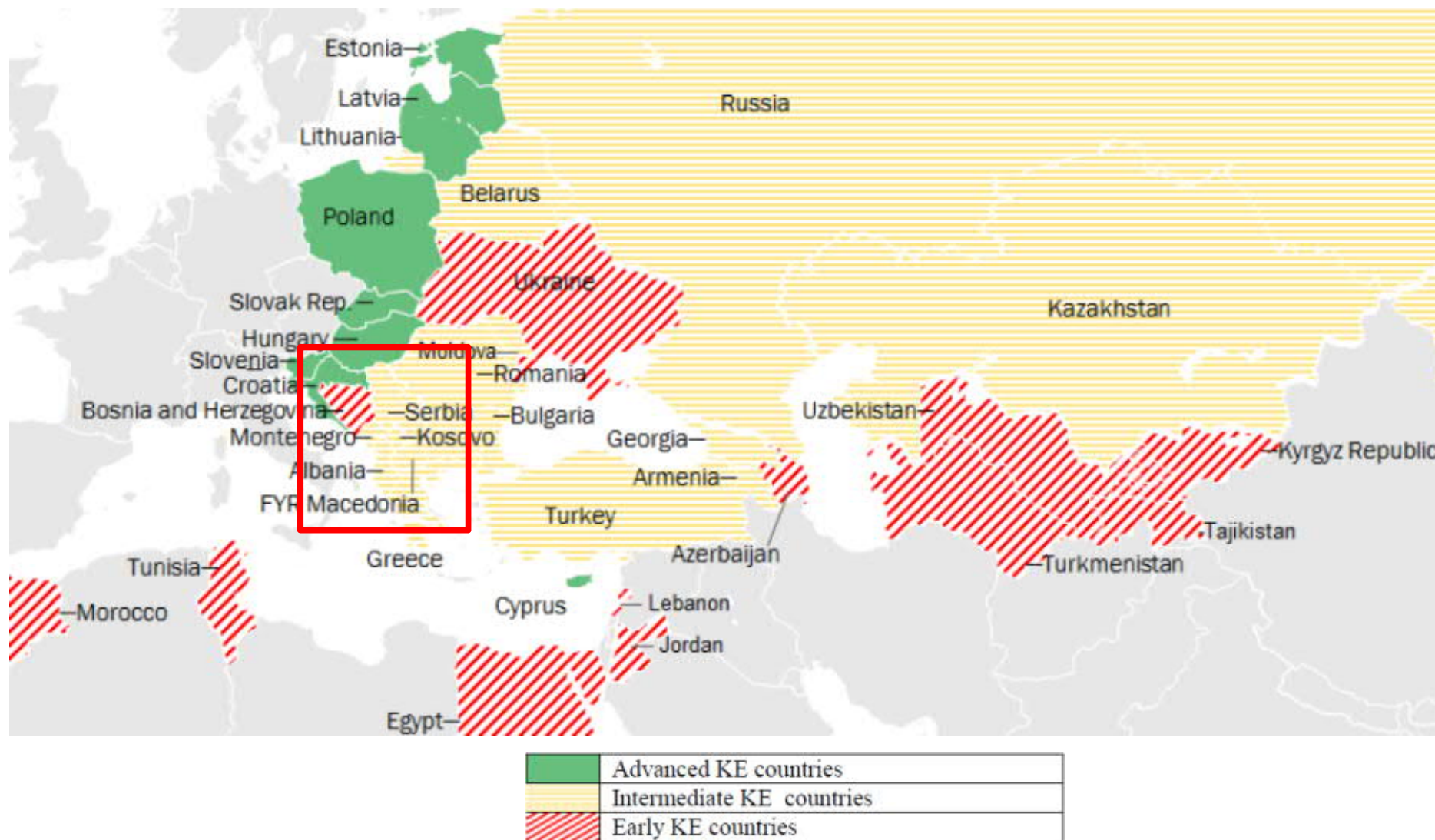
No one-size-fits-all policies to promote knowledge economy development

EBRD Knowledge Economy Index - performance by economy						
Economy	Total score (out of 10)	Ranking among EBRD economies	Pillar score (1 min - 10 max)			ICT infrastructure
			Institutions for innovation	Skills for innovation	Innovation system	
OECD comparators (average)	7.36		8.08	7.14	6.48	7.73
EBRD regions (average)	4.67		5.52	4.96	3.22	5.00
Serbia		13	5.76	5.46	3.26	6.02
Montenegro		14	6.20	5.16	2.88	5.92
North Macedonia		15	5.74	3.83	3.27	5.18
Albania		25	5.64	4.79	2.36	4.67
Bosnia and Herzegovina		29	5.04	4.13	2.88	4.35
Kosovo		35	4.81	2.75	3.12	2.20

# KE in the EBRD region



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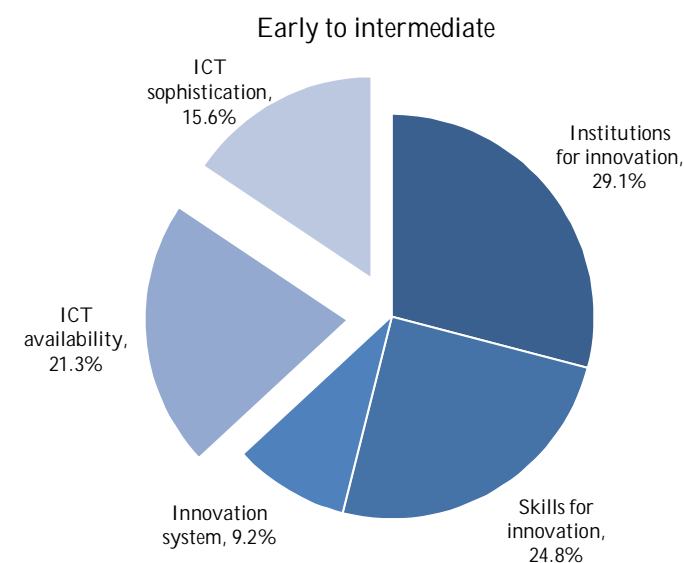
# ICT Infrastructure as a Key Pillar of KE



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Structure of the EBRD Knowledge Economy Index										
Pillar	Institutions for innovation			Skills for innovation		Innovation system			ICT infrastructure	
Dimensions	Economic openness	Business environment	Governance	General skills	Specialised skills	Inputs	Outputs	Linkages	ICT availability	ICT sophistication
From advanced to OECD comparators	16.1%			17.2%		43.1%			23.6%	
	0.4%	9.4%	6.2%	5.8%	11.4%	16.3%	12.8%	14.0%	11.9%	11.7%
From intermediate to advanced	34.8%			23.7%		18.1%			23.4%	
	5.3%	13.4%	16.0%	16.7%	7.0%	7.7%	6.9%	3.6%	16.1%	7.3%
From early to intermediate	29.1%			24.8%		9.2%			36.9%	
	7.6%	10.2%	11.4%	16.9%	7.9%	3.9%	1.0%	4.3%	21.3%	15.6%

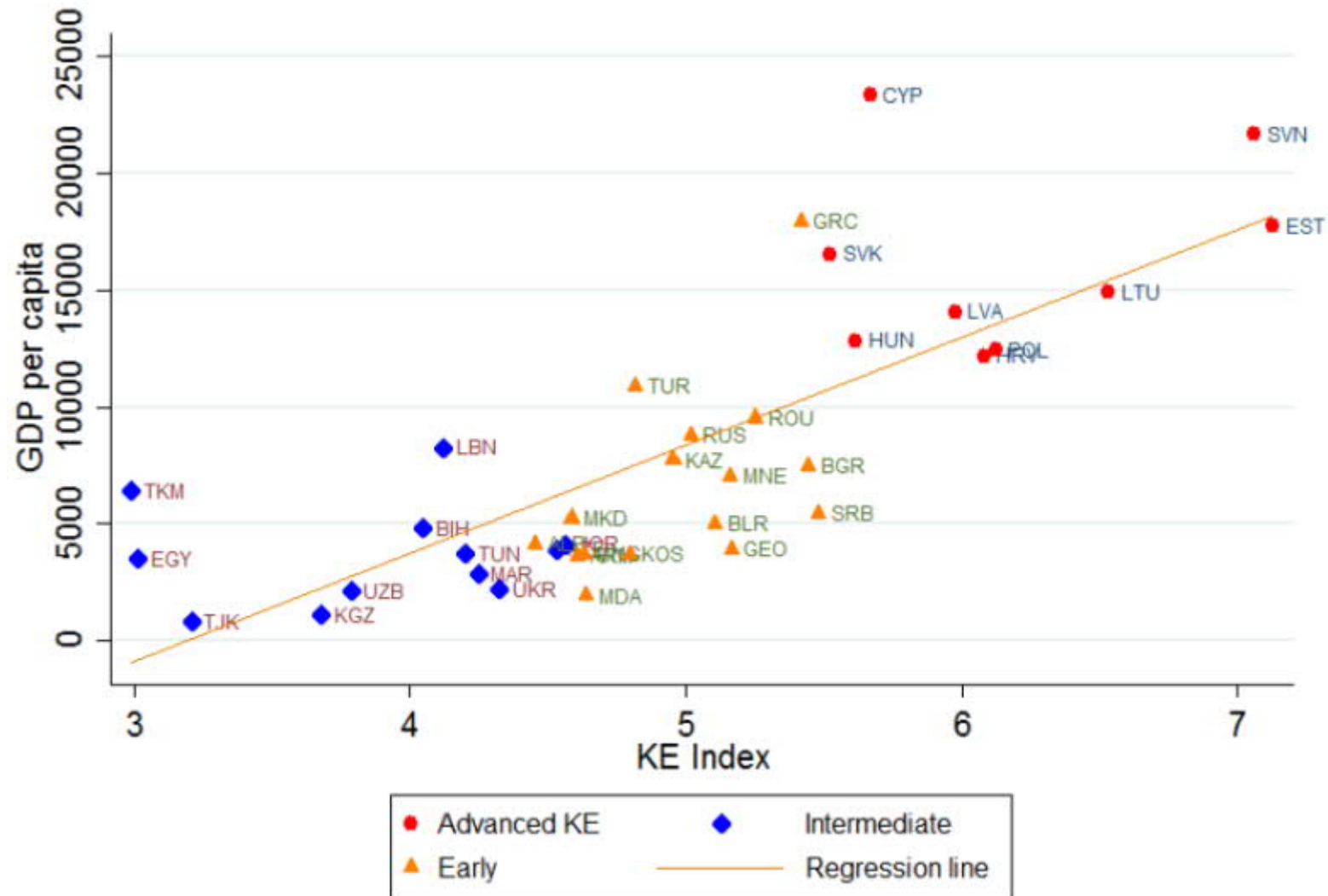
- For early KE economies ICT infrastructure represents 37% of KE index difference
- For intermediate and advanced economies ICT infrastructure represents 23% of KE Index difference



# Correlation between GDP per capita and KE Index



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# ICT Infrastructure Financing



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- The main challenge associated with fiber deployment is high cost of passive infrastructure and civil works
- EBRD has developed Generic Financial Model to estimate the costs of deploying broadband network

Generic Financial Model composed of:

## 1. Cost Model

1.1 Calculating demand and optimal network route (Geospatial)

1.2 Dimensioning the network access (Network module)

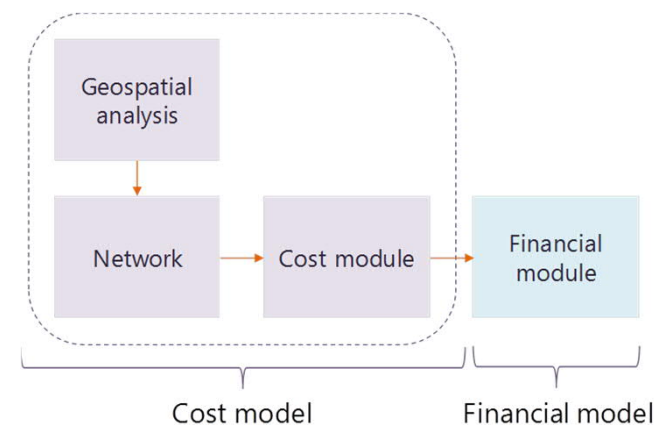
1.3 Calculating capex (Cost module)

## 2. Financial Model

2.1 Annualizing capex based on roll-out scenario

2.2 Calculating network opex

2.3 Calculating cash flows for different financial vehicle types



# ICT Infrastructure Financing: Cost Model



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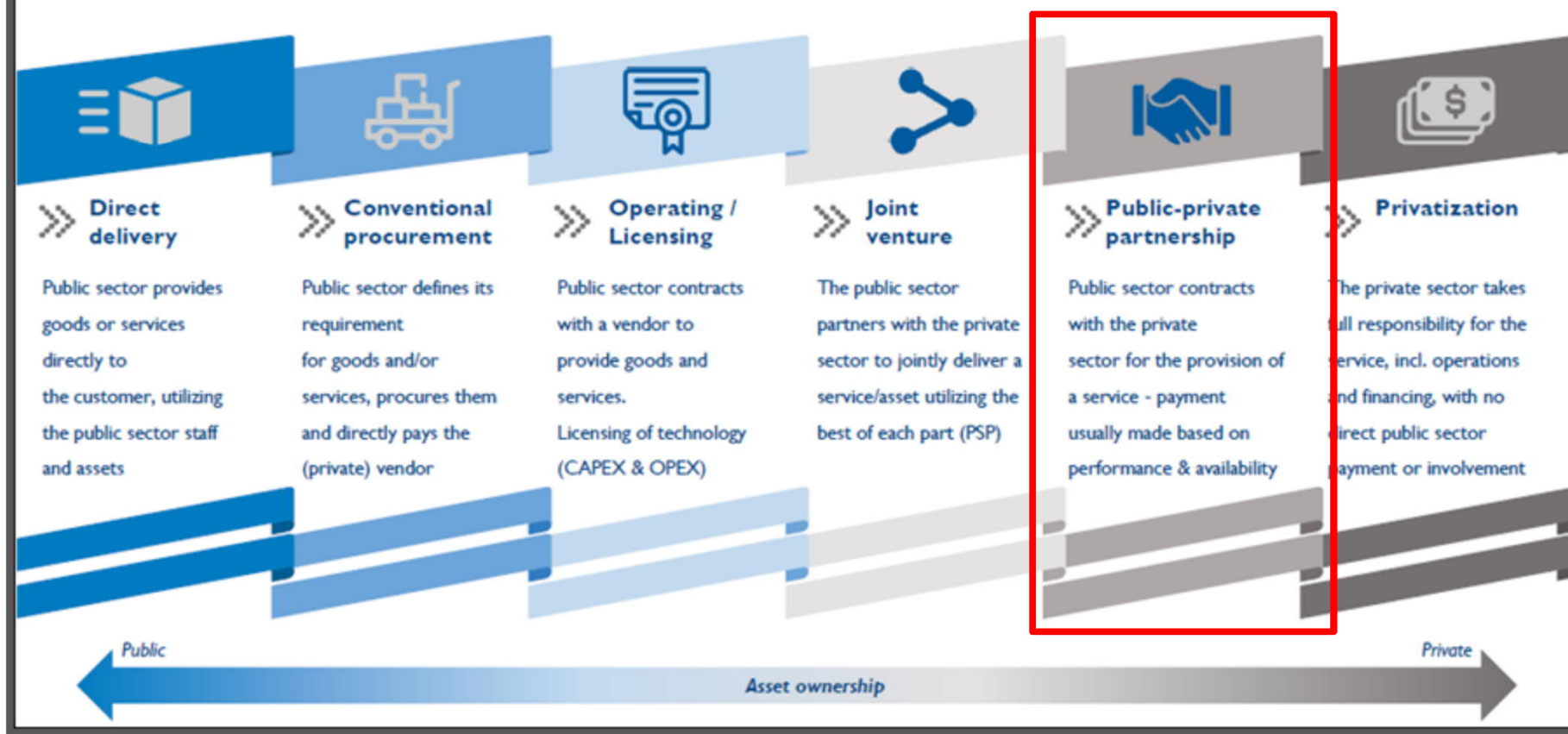
Cost Model analysis aims to determine costs that an operator would efficiently incur to deploy a fiber access network in specific underserved areas.

Some Input Parameter	Brief description of the input
<b>Geographic Coverage</b>	Very Rural and Rural: 1 – 100 inhabitants & 100 – 200 inhabitants per km <sup>2</sup> Village/Suburban: 200 – 1,000 inhabitants per km <sup>2</sup> Urban: 1,000 – 10,000 inhabitants per km <sup>2</sup> Very dense: 10,000 – 1,000,000 inhabitants per km <sup>2</sup>
<b>Soil Composition</b>	The civil work represents a significant part of the costs. In particular the cost of digging trenches for underground cable can represent up to 60-70% of the costs. International benchmarks have shown evidence that the main driver of the trenching cost is the type of soil. Indeed from normal to rocky soil the cost of digging trenches can be multiplied by 4.
<b>Technology Options and High Level Infrastructure</b>	<p>Core network <input checked="" type="checkbox"/> Backhaul and aggregation <input checked="" type="checkbox"/> Access network <input checked="" type="checkbox"/></p>
<b>% of existing underground infrastructure</b>	Portion of the underground infrastructure that is existent and can be re-used for the current deployment
<b>% of rocky soil</b>	Portion of the land located in rocky areas
<b># of operators (passive sharing)</b>	Number of operators expected to share the passive infrastructure
<b>Max # of premises per street cabinet</b>	Maximum number of premises which can be covered by single street cabinet
<b>Max distance between poles and manholes</b>	Maximum distance between the poles and manholes for the portion of the network being deployed
<b># of premises per OLT port</b>	Number of premises which can be covered by a single OLT port
<b>Labour cost</b>	Daily cost in EUR per single construction worker
<b>Nodes utilization rate</b>	Expected utilization rate of each of the nodes



# ICT Infrastructure Financing: Financing Model

The six types of project delivery vehicles enable the optimal allocation of risk between the public and private sector



# EBRD's Approach to ICT Infrastructure Development

EBRD's KEIs	ICT's actions	Alignment with WBIF
<ul style="list-style-type: none"> <li>- ICT Infrastructure is multidimensional and includes both: (i) ICT availability and (ii) ICT sophistication.</li> </ul>	<ul style="list-style-type: none"> <li>- Acceleration of roll-out of affordable, high-speed, fibre-optic based broadband.</li> <li>- Supporting e-Government projects.</li> </ul>	<ul style="list-style-type: none"> <li>- This part of KEI is aligned with the WBIF's Broadband Connectivity.</li> <li>- Guiding note by WBIF stresses the importance of Broadband Connectivity for the other pillars to flourish.</li> </ul>
<ul style="list-style-type: none"> <li>- Investing in Information infrastructure</li> <li>- Information systems development of fast and reliable broadband networks.</li> <li>- e-Government projects</li> </ul>	<ul style="list-style-type: none"> <li>- Equity and debt investments in telecommunication providers of television, internet, fixed and mobile telephony services to allow providers to enhance development of ICT networks.</li> <li>- Project Financing</li> </ul>	

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