

GEMS Navigator

User's Guide for the Platform



Global Economic Model and Study Tool
for Digital Infrastructure Deployment

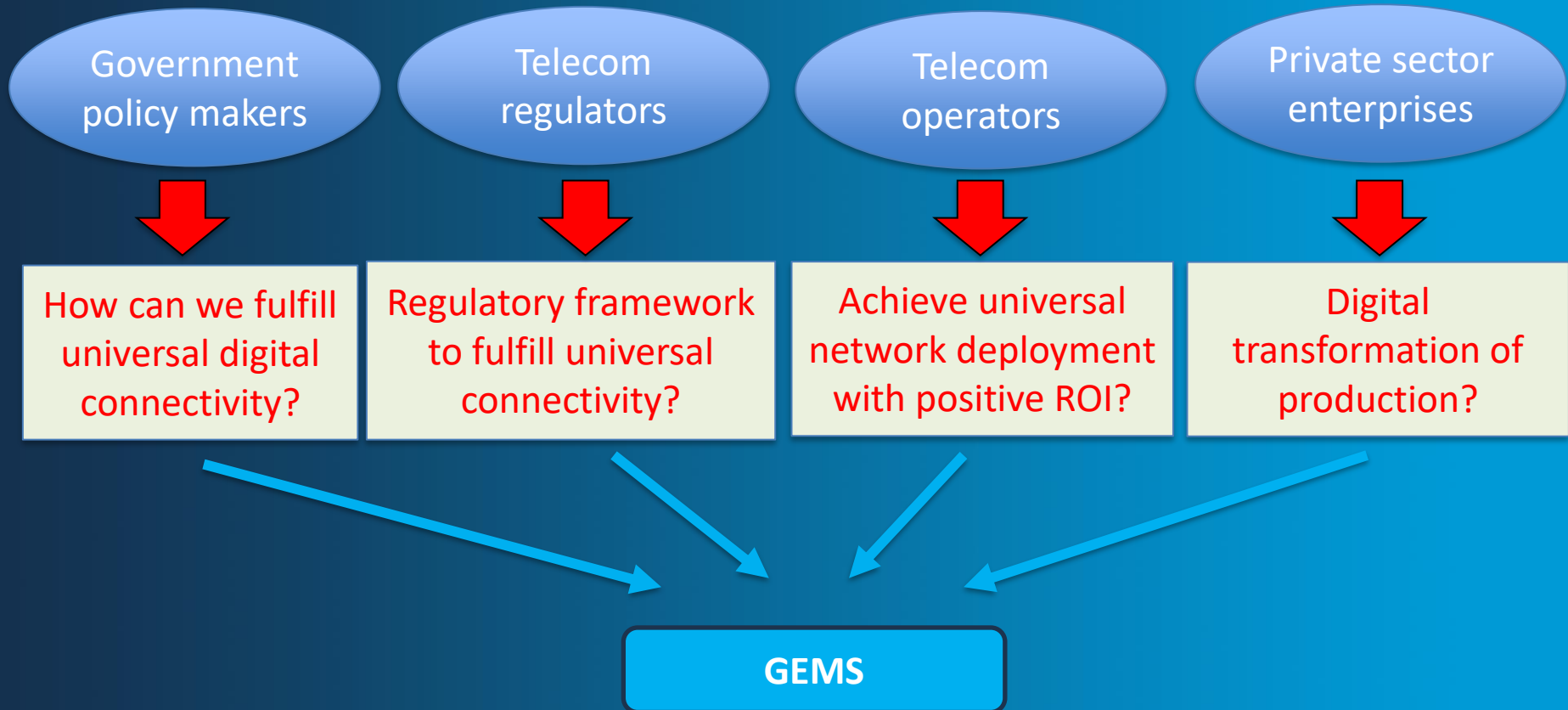
Purposes of the GEMS Tool

- Guide policymakers, regulators and the private sector on investment decisions, and in the application of regulatory practices to achieve full connectivity in a country
- The tool estimates investment requirements, potential returns on such investment, stipulating business opportunities and models
- The output is tailored to the context and capabilities of each country and region
- Finally, the tool leverages the use of models and resources already developed for the ITU

Practical Use Cases of the GEMS tool

- Use outputs to shape broadband plans and engage development partners (Multilateral Banks, Development Agencies)
- Compare the investments and returns associated with different technology solutions (e.g., wired, wireless)
- Find the optimal solution for each area of the country (urban, suburban, rural)
- Explore satellite backup options for rural areas
- Analyze the optimal policies to make investments possible

GEMS should be used to frame a discussion among stakeholders



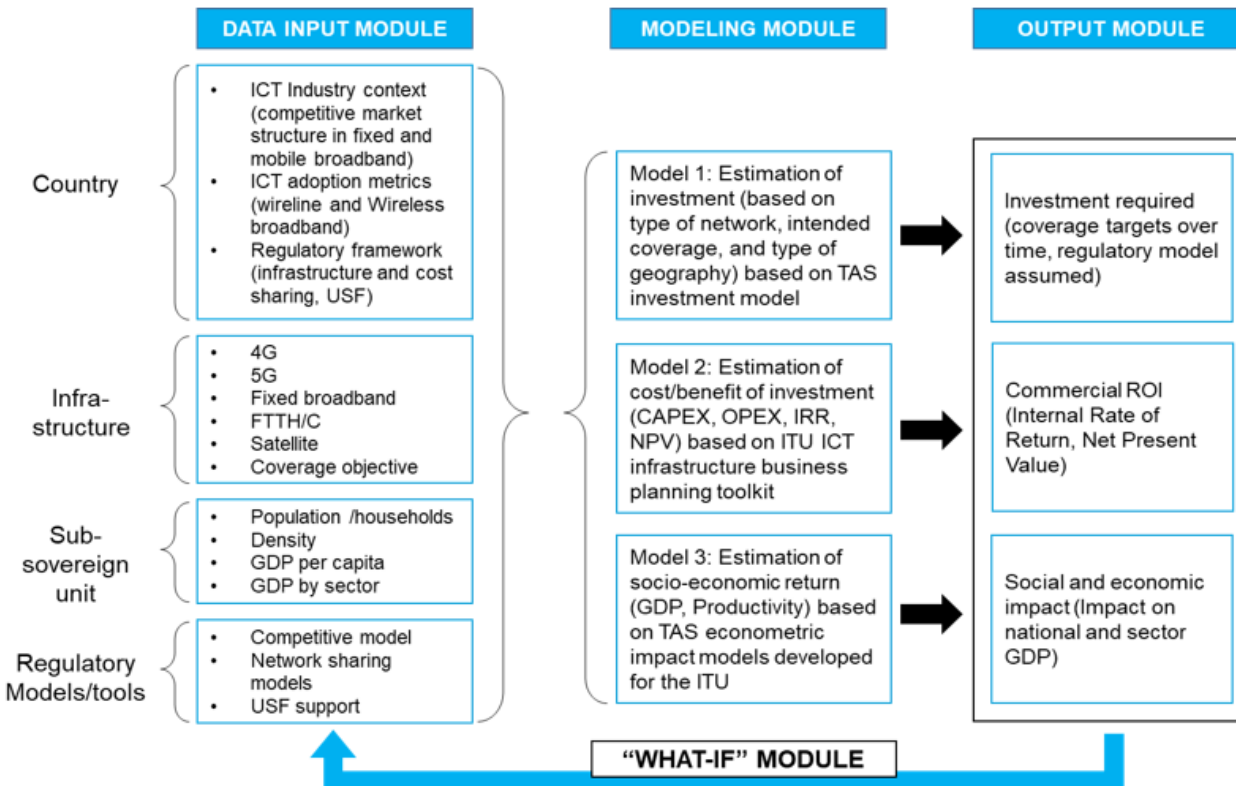
Overall Caveats of GEMS platform (I)

- To calculate investment and return estimates the platform requires entering all data fields; even if data is not available, the user will have to provide reliable estimates for all data
- The platform provides calculation of average investment and returns under a range of assumptions and econometric models within a confidence interval
- Platform estimates provide an initial calculation of investment and results for a particular project/plan, which require further refinement in case they will be used for business case development

Overall Caveats of GEMS platform (II)

- The platform does not address topography conditions affecting investment; it only considers population density as a cost driver – if user needs to incorporate topographic considerations, use of the CPP platform for restricted territories is advisable
- The regulatory options menu to simulate is limited, constrained by the availability of data for a cross-country sample
- Beyond urban / suburban / rural, the model does not provide more granular disaggregation (e.g., covering specific schools or municipalities); in this case, rely on the CPP platform

GEMS Tool: Conceptual Structure



Datasets:

Combines user-provided and system-provided datasets to create the foundation for accurate, real-world economic impact analysis.

Models:

Econometric models apply technical and cost parameters to simulate economic impact of different technology options and calculate social and private returns.

Scenarios:

Allows testing alternative regulatory scenarios to support decisions regarding bankable business case

1. Access the Login Page

1.1. Log In to Start working

Once approved, log in using:

- Your email
- Your password

After login, you gain access to:

- GEMS tool

All tools and models are available to your user role.

1.2. User Roles

The GEMS tool supports economic assessment tool:

- *Viewer*: Can view results of simulations
- *Analyst*: Can develop simulation scenarios, enters data
- *Administrator*: Can manage users, data, and country workspace

2. Enter economic and demographic country data

Ensuring that the data you provide is accurate, complete, and relevant is essential — the platform's analysis, modelling, and final recommendations will be based on the datasets you create and upload.

2.1 Upload main national indicators

Enter:

- Main socioeconomic indicators of the country under consideration

Potential data sources: International Monetary Fund, World Bank, or National Statistics Office

The screenshot shows a web interface for entering data. At the top, it says 'Step 1: Input data'. Below that is a 'Settings' dropdown menu. There are three tabs: 'Country data' (which is selected), 'ICT base values', and 'Current regulatory measures'. Under the 'Country data' tab, there is a section titled 'Main socioeconomic indicators'. This section contains three input fields, each with a value and minus/plus buttons for adjustment. The first field is 'GDP (USD billion)' with the value '88,33'. The second field is 'Total population' with the value '35605523'. The third field is 'Households' with the value '9890423'. A red arrow points from the text 'Main socioeconomic indicators of the country under consideration' to the 'Main socioeconomic indicators' section header. Another red arrow points from the text 'Potential data sources: International Monetary Fund, World Bank, or National Statistics Office' to the input fields.

Indicator	Value
GDP (USD billion)	88,33
Total population	35605523
Households	9890423

2. Enter economic and demographic country data

2.2 Upload sectoral structure of the economy

Enter:

- Weight of each sector of the national economy (as % of GDP)
- This might require a calculation of percentages
- Possible sources: Local National Accounts

Warnings:

- (i) Not all sources provide a consistent structure of the economy
- (ii) Sometimes the sector structure is not for the same year as GDP values; if so, calculate the share for the GDP of the year it is reported

Sectoral structure of the economy (% of GDP) ⓘ

Administrative and Support	0,58	-	+	Construction	4,93	-	+
ICT	2,91	-	+	Manufacturing	10,79	-	+
Transportation and Storage	6,00	-	+	Wholesale and Retail Trade	22,27	-	+
Financial and Insurance	3,56	-	+	Professional, Scientific and Technical services	0,58	-	+
Health	1,74	-	+				

2. Enter economic and demographic country data

2.2 Upload population subnational disaggregation for urban, suburban and rural areas

Enter:

- Population density in each area
- Share of population living in each area

Potential data sources: Local National Accounts, National Household Survey, or secondary sources

Warning:


(i) Data does not need to be for the year of analysis; demographic statistics do not change substantially in the short term

Indicators by sub-national regions













Urban areas	Population density (persons/km ²)	4935
	Share of population living in this region (%)	14,53
Suburban areas	Population density (persons/km ²)	230
	Share of population living in this region (%)	46,65
Rural areas	Population density (persons/km ²)	90
	Share of population living in this region (%)	38,82



3. Enter base values for the telecom/ICT sector

3.1 Upload data for country telecom sector

- Fixed and mobile broadband coverage, adoption, average speed, average price, and CAPEX per capita
- Fixed and mobile services revenues
- Satellite broadband indicators (Users, Service and Kit prices)
- Sources: Local regulator, ITU Data Hub, Telecom operators
- If need of clarification, click on 

Country data ICT base values Current regulatory measures

Fixed Broadband (FBB) indicators	Mobile Broadband (MBB) indicators
FBB Capex per capita (USD/year) 	Mobile Broadband Capex per capita (USD/year) 
3,32 - +	6,52 - +
FBB coverage (% households) 	4G coverage (% population) 
4,29 - +	50,00 - +
FTTH coverage (% households) 	5G coverage (% population) 
3,87 - +	13,57 - +
FBB speed (Mbps) 	MBB speed (Mbps) 
50,42 - +	21,20 - +
FBB price (USD/month) 	MBB price (USD/month) 
7,28 - +	2,18 - +
FBB adoption (% households) 	MBB adoption (unique subscribers % population) 
3,63 - +	33,59 - +

Revenue from fixed services (USD million/year) 	Revenue from mobile services (USD million/year) 
34,20 - +	1249,56 - +
Satellite broadband indicators	
Existing LEO users	
100000 - +	
Price of LEO broadband service (USD/month)	
46,34 - +	
Price of LEO hardware kit (USD)	
204,00 - +	

3. Enter base values for the telecom sector regulatory framework

3.2 Upload telecom sector regulatory framework

- Telecom licences exemption
- Quality of service monitoring
- Infrastructure sharing regime
- Co-location/site sharing regime
- Spectrum secondary trading
- Band migration allowed
- Source: ITU Regulatory Tracker

Warning:

(i) You do not need to click all the regulatory measures of the Tracker, only the ones indicated in the tool for the country under consideration

The screenshot displays a web form titled 'Types of licences provided'. It features several sections with dropdown menus and checkboxes. Red arrows from the text on the left point to specific options in the form: 'License exempt', 'Quality of service monitoring required', 'Infrastructure sharing for mobile operators permitted', 'Co-location/site sharing mandated', and 'Band migration allowed'. The form also includes sections for 'Secondary trading allowed', 'Number portability available to consumers and required from fixed-line operators', 'Number portability available to consumers and required from mobile operators', 'Individual users allowed to use VoIP', and 'National plan that involves broadband'.

Section	Option	Selected
Types of licences provided	Only Multi-service individual licenses or class licences	Yes
License exempt	License exempt	Yes
Operators required to publish Reference Interconnection Offer (RIO)	Operators required to publish Reference Interconnection Offer (RIO)	No
Interconnection prices made public	Interconnection prices made public	No
Quality of service monitoring required	Quality of service monitoring required	Yes
Infrastructure sharing for mobile operators permitted	Infrastructure sharing for mobile operators permitted	Yes
Infrastructure sharing mandated	Infrastructure sharing mandated	No
Co-location/site sharing mandated	Co-location/site sharing mandated	Yes
Unbundled access to the local loop required	Unbundled access to the local loop required	No
Secondary trading allowed	No	No
Band migration allowed	Band migration allowed	Yes
Number portability available to consumers and required from fixed-line operators	No	No
Number portability available to consumers and required from mobile operators	Yes	Yes
Individual users allowed to use VoIP	VoIP services are legal to provide and use	Yes
National plan that involves broadband	National plan that involves broadband	Yes

4. Enter data regarding national network deployment objectives

4.1. Enter:

- For each technology, fill the level of national coverage to simulate (subnational groups will be adjusted automatically)
- For each technology, fill the years to reach the target (from 2 to 10 by relying on the sliding scale)

Warning:

- (i) If you do not want to simulate a particular technology, just leave the white cell empty (or put a zero)

Step 2: Scenarios

Targets Policy

FTTH simulation

FTTH coverage target (% households)

Years

	National	Urban	Suburban	Rural
Target	61.0%	100.0%	99.6%	0.0%
Current	3.9%	26.6%	0.0%	0.0%

4G simulation

4G coverage target (% population)

Years

	National	Urban	Suburban	Rural
Target	90.0%	100.0%	100.0%	74.2%
Current	50.0%	100.0%	76.0%	0.0%

5G simulation

5G coverage target (% population)

Years

	National	Urban	Suburban	Rural
Target	20.0%	100.0%	11.7%	0.0%
Current	13.6%	93.4%	0.0%	0.0%

Satellite

Country is served by LEO satellite broadband: Low Earth Orbit (LEO)

Wireless rural coverage target including non-LEO Sat (% pop.)

4. Define policies and regulations that can stimulate network deployment

4 2. Enter:

- Indicate which regulatory reforms you want to simulate
- Potentially, subsidies for infrastructure deployment can be introduced (share of investment to be covered by the state through USF or another tool)
- Demand can also be stimulated through subsidies to reduce prices to end-consumers

Step 2: Scenarios

Targets Policy

Regulatory reforms to simulate

- Spectrum secondary trading
- Band migration allowed
- Infrastructure sharing for mobile operators permitted
- Infrastructure sharing mandated
- Co-location/site sharing mandated

Government subsidy for investment

Fixed Broadband (%)

5,00

4G+5G Broadband (%)

30,00

Satellite Broadband (%)

0,00

Government subsidy for demand

Wired Broadband (%)

0,00

Wireless Broadband (%)

40,00

Pop. subsidized (%)

50,00

Government subsidy for LEO

LEO Broadband fee (%)

0,00

Subsidy to LEO hardware kit (%)

0,00

4. An additional incentive can be defined through sector contributions

4.3. Enter:

- Potentially, a fee can be charged to other sectors of the economy to contribute to finance the broadband investment
- This is simulated by entering the fee imposed as a share of the sector revenues

Warnings:

- (i) A starting point could be 0.05% of revenues
- (ii) Different sectors may face different contributions

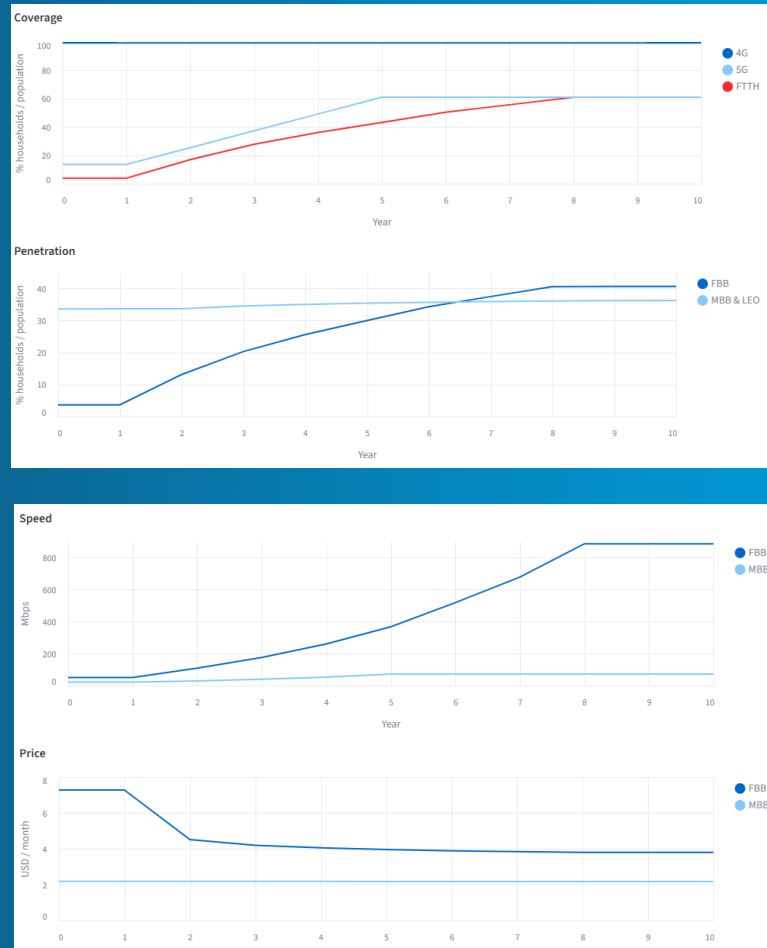
Contribution of other sectors (%) ⓘ

Administrative and Support	0,00 -- *	Construction	0,00 -- *
Manufacturing	0,00 -- *	Transportation and Storage	0,00 -- *
Wholesale and Retail Trade	0,00 -- *	Financial and Insurance	0,00 -- *
Prof., Scientific and Technical services	0,00 -- *	Health	0,00 -- *
Other sectors	0,00 -- *		

5. First output: network deployment objectives

5.1. Network deployment objectives:

- Coverage and adoption of all network technologies (FTTH, Mobile Broadband, 4G, 5G, Satellite)
- Outcomes for a 10-year period



5. Second output: Return on Investment for Telecom operator

5.2. ROI for telecom operator:

- Results are grouped for wired / wireless technologies.
- Maintenance of legacy infrastructure is omitted from investment requirements
- Investment induced by regulatory reforms is also omitted, as it comes from cost-savings reform

Outputs

Investment & Impact Coverage Time series Impact scenarios

Wired

	Value
Wired investment needed	USD 1,392,343,015
Wired investment induced by reg. reform	USD 26,056,015
Wired investment covered by government	USD 69,617,151
Wired investment covered by other sectors fee	USD 0
Wired revenues generated	USD 705,684,977
Net result for operator	USD -590,984,272
ROI for operator (%)	-42.45%

Wireless

	Value
4G+5G investment needed	USD 1,126,255,665
Satellite investment needed	USD 1,079,439,222
Total wireless investment needed	USD 2,205,694,887
Wireless investment induced by reg. reform	USD 36,265,432
Wireless investment covered by government	USD 537,876,700
Wireless investment covered by other sectors fee	USD 0
Wireless revenues generated	USD 3,082,775,659
Net result for operator	USD 1,251,222,903
ROI for operator (%)	56.73%

5. Third output: Return on Investment for economic sectors

5.3. ROI for economic sectors:

- Overall results for the IT sector (includes investment, revenue and spillovers).
- Impact on the rest of the economy

Impact on ICT sector

	Value
IT sector investment needed	USD 3,598,037,903
Cost savings due to reg. reform	USD 62,322,047
Investment covered by government	USD 407,493,850
Investment covered by other sectors fee	USD 0
IT sector revenues	USD 3,788,460,636
Net result for operator	USD 660,238,631
ROI for operator (%)	18.35%
IT sector spillovers	USD 801,170,655
Net result IT sector (Inc. spillovers)	USD 1,461,409,286
Net result IT sector (% of investment)	40.62%
Net result IT sector (% of cumulated sector GDP)	6.25%
Investment for maintenance	USD 0

Impact over the rest of the economy

	Impact	Impact (%)	After fee (%)
Administrative and Support	USD 108,202,419	2.18%	2.18%
Construction	USD 38,409,953	0.10%	0.10%
Manufacturing	USD 913,905,141	1.05%	1.05%
Transportation and Storage	USD 185,871,116	0.40%	0.40%
Wholesale and Retail Trade	USD 2,707,719,651	1.47%	1.47%
Financial and Insurance	USD 432,370,026	1.47%	1.47%
Professional, Scientific and Technical services	USD 70,308,798	1.47%	1.47%
Health	USD 211,766,971	1.47%	1.47%
IT	USD 626,160,051	2.47%	
Other sectors	USD 5,669,808,926	1.47%	1.47%
Total	USD 10,964,578,651	1.34%	
Total spillovers	USD 10,926,168,698	1.33%	

5. First simulation result: Total economic impact (measured as % of GDP)

5.4. Social return:

- An investment may not be worth for the telecom operator, but it is surely good for the society as a whole!

Total impact	
	Value
Investment needed	USD 2,370,833,917
Cost savings due to reg. reform	USD 59,406,104
Investment for maintenance	USD 0
Cost for the government	USD 0
Cost for other sectors	USD 0
Total economic impact	USD 11,063,527,164
Total economic impact (% GDP)	1.46%
Net result	USD 9,652,099,351
Net result (% investment)	407.12%
Net result (% of cumulated GDP)	1.18%

5. First simulation result: However, the ROI for the telecom operator is negative

5. Output provided

- Detail is provided for both wired and wireless technologies
- ROI (%) for telecom operator associated with the deployment projects.
- A negative ROI indicates that no operator will be willing to conduct the project, being necessary to simulate further policy and regulatory reforms, that can contribute to a positive ROI

Wired	
	Value
Wired investment needed	USD 1,386,442,874
Wired investment induced by reg. reform	USD 30,250,140
Wired investment covered by government	USD 0
Wired investment covered by other sectors fee	USD 0
Wired revenues generated	USD 850,408,347
Net result for operator	USD -505,784,387
ROI for operator (%)	-36.48%

Wireless	
	Value
4G+5G investment needed	USD 905,464,730
Satellite investment needed	USD 78,926,313
Total wireless investment needed	USD 984,391,043
Wireless investment induced by reg. reform	USD 29,155,964
Wireless investment covered by government	USD 0
Wireless investment covered by other sectors fee	USD 0
Wireless revenues generated	USD 148,540,166
Net result for operator	USD -806,694,913
ROI for operator (%)	-81.95%

5. At this point, it is useful to have a discussion as to how to proceed

FIRST RESULTS

- Fulfilling telecommunication deployment targets has a positive impact on the GDP
- However, the return on investment ROI for telecom operators associated with the deployment projects is negative
- A negative ROI indicates that no operator will be willing to conduct the project

KEY QUESTION

- What kind of regulatory changes or funding incentives can be made that can contribute to a positive ROI of telecom operators?

TECHNOLOGY OPTION

Rely on satellite technology (wholesale or LEO option) to reach remote areas

REGULATORY OPTION

Enforce infrastructure sharing to lower deployment costs

FUNDING OPTION

Increase USO or charge a fee to other sectors benefitting from telecommunications

6. Based on the first results, the user can start changing inputs to render the business case more attractive

1st scenario: USF financing a share of investment

2nd scenario: (1) + government subsidy 40% of price for 30% of population

3rd scenario: (2) + 0.05% fee on other sectors

Wired	
	Value
Wired investment needed	USD 1,386,442,874
Wired investment induced by reg. reform	USD 30,250,140
Wired investment covered by government	USD 415,932,862
Wired investment covered by other sectors fee	USD 0
Wired revenues generated	USD 850,408,347
Net result for operator	USD -89,851,525
ROI for operator (%)	-6.48%

Wireless	
	Value
4G+5G investment needed	USD 905,464,730
Satellite investment needed	USD 78,926,313
Total wireless investment needed	USD 984,391,043
Wireless investment induced by reg. reform	USD 29,155,964
Wireless investment covered by government	USD 362,185,892
Wireless investment covered by other sectors fee	USD 0
Wireless revenues generated	USD 148,540,166
Net result for operator	USD -444,509,021
ROI for operator (%)	-45.16%

Wired	
	Value
Wired investment needed	USD 1,386,442,874
Wired investment induced by reg. reform	USD 30,250,140
Wired investment covered by government	USD 415,932,862
Wired investment covered by other sectors fee	USD 0
Wired revenues generated	USD 882,278,669
Net result for operator	USD -57,981,203
ROI for operator (%)	-4.18%

Wireless	
	Value
4G+5G investment needed	USD 905,464,730
Satellite investment needed	USD 78,926,313
Total wireless investment needed	USD 984,391,043
Wireless investment induced by reg. reform	USD 29,155,964
Wireless investment covered by government	USD 362,185,892
Wireless investment covered by other sectors fee	USD 0
Wireless revenues generated	USD 514,169,216
Net result for operator	USD -75,799,971
ROI for operator (%)	-8.01%

Wired	
	Value
Wired investment needed	USD 1,386,442,874
Wired investment induced by reg. reform	USD 30,250,140
Wired investment covered by government	USD 415,932,862
Wired investment covered by other sectors fee	USD 241,108,628
Wired revenues generated	USD 882,278,669
Net result for operator	USD 183,127,425
ROI for operator (%)	13.21%

Wireless	
	Value
4G+5G investment needed	USD 905,464,730
Satellite investment needed	USD 78,926,313
Total wireless investment needed	USD 984,391,043
Wireless investment induced by reg. reform	USD 29,155,964
Wireless investment covered by government	USD 362,185,892
Wireless investment covered by other sectors fee	USD 165,491,007
Wireless revenues generated	USD 514,169,216
Net result for operator	USD 26,511,036
ROI for operator (%)	8.80%



GEMS is a strategic enabler to address the coordination among governments, private sector, multilateral institutions, and civil society to address the connectivity challenge

- Positioned as a “diplomatic instrument” to help policy makers negotiate with Multilateral Development Banks, sovereign funds, and other sectors ministries (e.g. finance, health, education, etc.) and agencies (innovation, technology competitiveness, etc.)
- Promoted as an advocacy platform that can help regulators promote the idea of collaborative digital investment to other sectors of the economy
- Help the private sector with access to capital
- Stimulate awareness in other government agencies regarding the connectivity challenge