# Giga

## data collection, computations and monitoring

# Giga

## Giga: An initiative to connect every school to the Internet, and every young person to information, opportunity and choice

Giga targets unconnected and under-connected schools

Unconnected communities can get access to the Internet along with schools. Schools can serve as area nodes

# Engaging with Giga

**Map** schools to identify connectivity gaps

Implement fit-for-purpose infrastructure to **Connect** schools and ultimately every community and every citizen

Build affordable and sustainable **Finance** models

**Empower** learning and other skills and services via appropriate Digital Public Goods

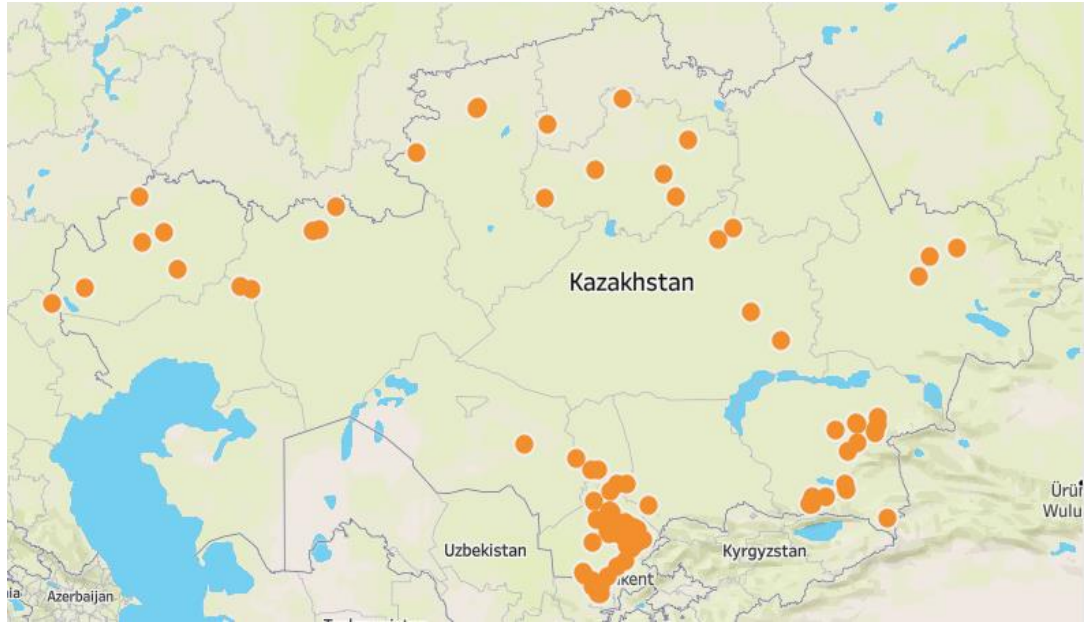
# Deliverables

1. School dataset
2. Infrastructure dataset
3. Topology map
4. Economic estimations
5. Real-time monitoring system

# School dataset

**Why**: to identify unconnected and under-connected schools, estimate required bandwidth
**What**: school location, population and connectivity data
**How**: requests to the MoE
**Tools**: questionnaires, GIS

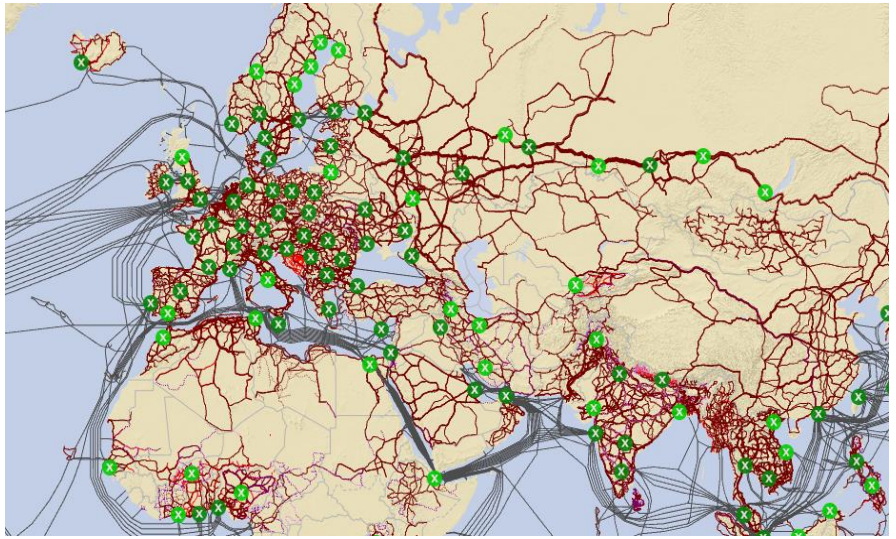
| Data type | Source |
|---|---|
| School coordinates | MoE |
| Number and type of users | MoE |
| Availability and speed of broadband connection | MoE, TOs |
| Broadband connection technology | MoE, TOs |
| Availability of electricity | MoE |



# Infrastructure dataset

**Why**: to identify options to connect schools
**What**: infrastructure data
**How**: requests to the TA, (W)ISPs, data from open sources
**Tools**: questionnaires, GIS

| Data type | Source |
|---|---|
| Mobile broadband network coverage, 3/4/5G | MNOs, coverage maps |
| Satellite internet coverage | SNOs, coverage maps |
| Fiber nodes (LoS and road distances) | FNOs, GIS |
| Node capacity (community access) | MNOs, FNOs |

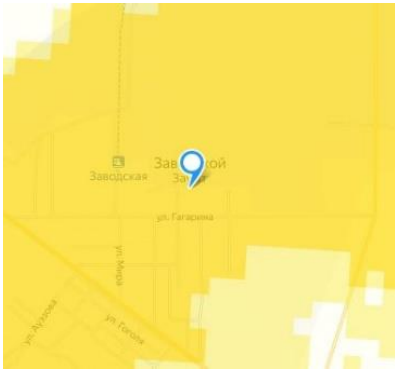


https://www.itu.int/itu-d/tnd-map-public/

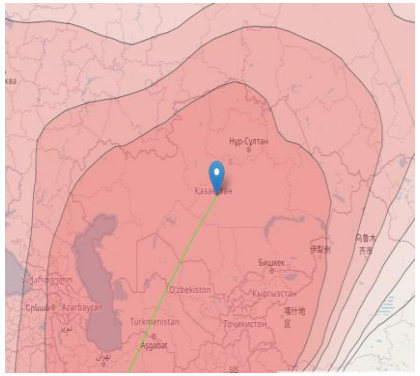
# Sample school connectivity dataset

| Region | Locality | School | Connection | Electricity | Latitude | Longitude | Student num | PC num | Mobile broadband | Distance to fiber node |
|---|---|---|---|---|---|---|---|---|---|---|
| R1 | L1 | S1 | No | Yes | 42.183155 | 69.866095 | 1,209 | 30 | 4G | 2 |
| R2 | L2 | S2 | No | Yes | 43.213118 | 76.847531 | 1,160 | 285 | 4G | 2 |
| R1 | L3 | S3 | No | Yes | 42.262161 | 69.946861 | 686 | 84 | 3G | 3.5 |
| R3 | L4 | S4 | No | Yes | 40.873532 | 68.332802 | 330 | 56 | 3G | #N/A |
| R4 | L5 | S5 | No | Yes | 43.40955 | 76.942242 | 322 | 1 | 4G | 5.5 |
| R1 | L6 | S6 | No | Yes | 42.185251 | 70.062192 | 268 | 13 | 3G | 6 |
| R5 | L7 | S7 | No | Yes | 42.487043 | 70.003494 | 236 | 56 | 4G | 3 |
| R1 | L8 | S8 | No | Yes | 42.204524 | 70.202658 | 177 | 27 | 3G | #N/A |
| R6 | L9 | S9 | No | Yes | 42.326688 | 69.572382 | 169 | #N/A | 4G | 3.2 |
| R1 | L1 | S10 | No | Yes | 42.191081 | 69.820373 | 169 | #N/A | 4G | 6.3 |

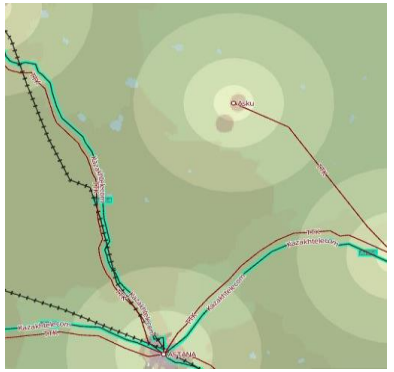
School location



Mobile broadband



Satellite coverage



Fiber nodes


School map

# Price data

**Why**: to compute connection economic parameters
**What**: labor costs, telecommunication and energy infrastructure installation and maintenance costs, channel rent fees
**How**: telecommunications market survey; design, construction and maintenance organizations; construction standards; price reference books; (W)ISPs; etc.
**Tools**: market research, proxy-based estimates

# Economic estimates

**Why**: to select technologies, estimate expenses
**What**: OPEX, CAPEX, potential income, cost of ownership, NPV
**How**: apply algorithms to school connectivity and price data
**Tool**: Broadband diagnostic tool (https://connectschools.online/)

| Required Bandwidth, Mbps | Technology of Broadband Connection | | | | | | | | | | Recommended technology | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fiber Optic | | | Microwave Link | | | Satellite | | Cellular | | | |
| | CAPEX, USD | OPEX, USD per year | INCOME, USD per year | CAPEX, USD | OPEX, USD per year | INCOME, USD per year | CAPEX, USD | OPEX, USD per year | CAPEX, USD | OPEX, USD per year | Based on maximum NPV (5-years) | Based on minimal cost of ownership (5-years) |
| 53.5 | 10,288.35 | 6,990.90 | 804.94 | 13,552.35 | 7,197.08 | 19.24 | 12,298.23 | 45,238.89 | 970.77 | 4,579.68 | Cellular | Cellular |

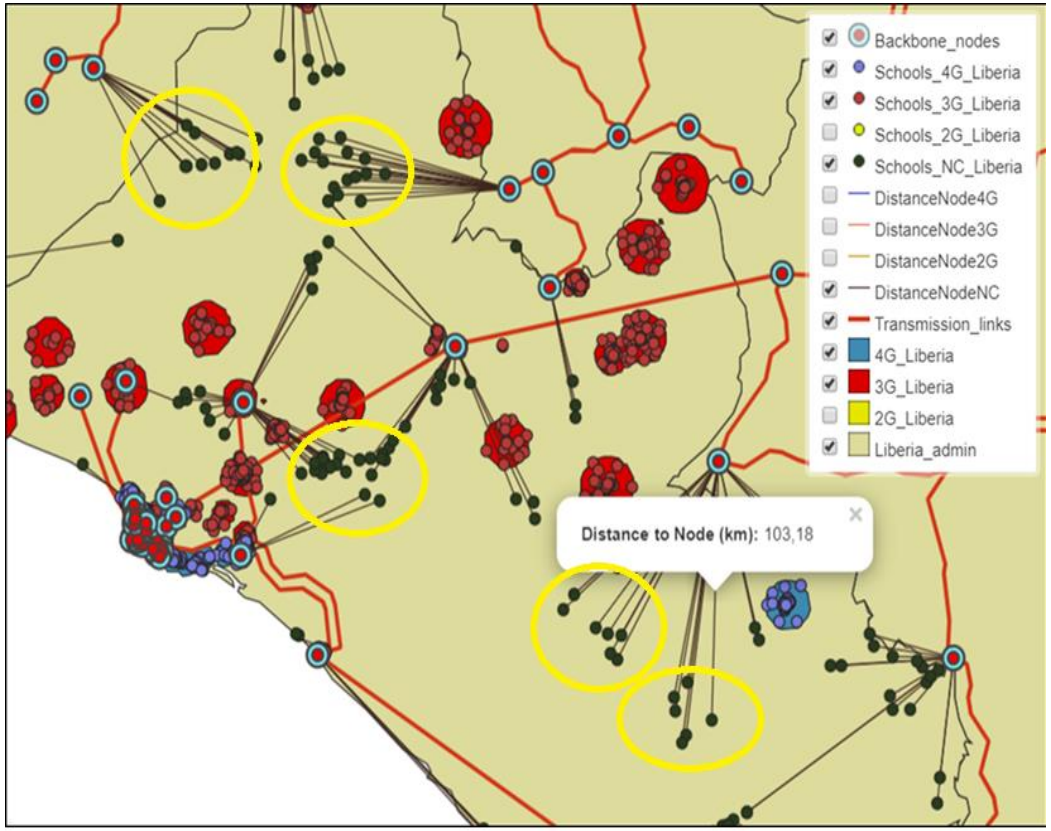
# Network model example

| FOCL CAPEX components |
| --- |
| Geodetic work |
| FOCL installation |
| Horizontal directional drilling |
| Cable duct construction |
| Cable laying machine use |
| Cable manhole construction |
| Cable coupling installation |
| FOCL signaling test |
| Building entrance facilities, ODFs installation |
| Design |
| |
| **FOCL OPEX components** |
| FOCL maintenance along the route |
| Cable duct maintenance |
| Building entrance facilities and ODFs maintenance |
| Communication channels rent cost |

# Topology map

**Why**: to distribute resources efficiently
**What**: interconnections between nodes
**How**: apply algorithms to school connectivity, infrastructure and price data

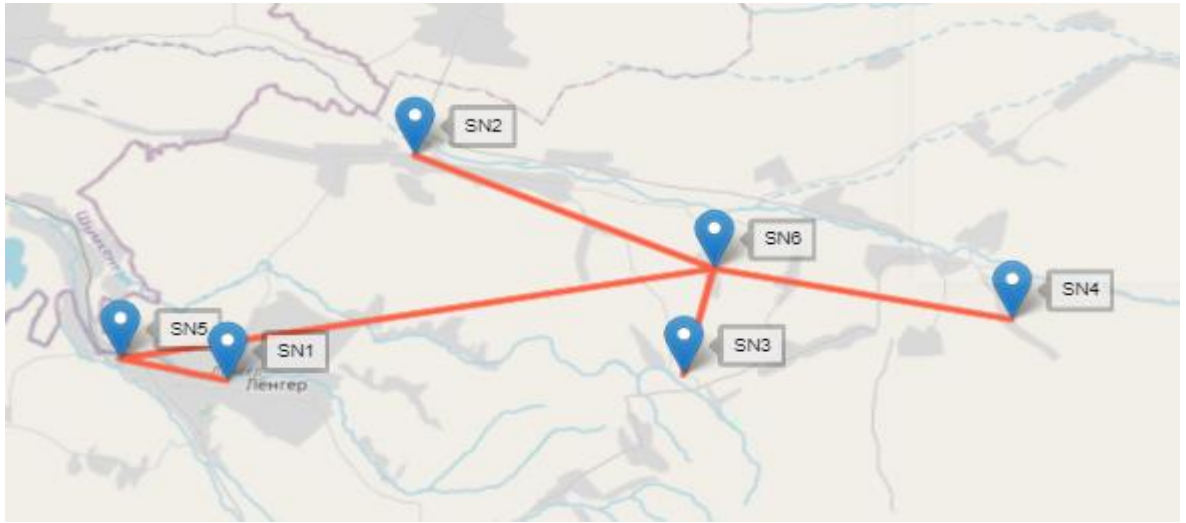
**Tools**: ITU Interactive Transmission Maps, Broadband diagnostic tool



# Topology map example

Microwave links network interconnecting six schools:

(cost of ownership is used as an optimization criterion)




| # | School Name | Region | Subregion | Lattitude | Longtitude | Type of Cell Coverage (2G / 3G / 4G) | Availability of electricity (Yes / No) | Distance to the fiber*, km | Total number of users* |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SN1 | RN1 | SRN1 | 42.183155 | 69.866095 | 4G | Yes | 2 | **1270** |
| 2 | SN2 | RN2 | SRN2 | 42.262161 | 69.946861 | 3G | Yes | 3.5 | **721** |
| 3 | SN3 | RN3 | SRN3 | 42.185251 | 70.062192 | 3G | Yes | 6 | **282** |
| 4 | SN4 | RN4 | SRN4 | 42.204524 | 70.202658 | 3G | Yes | 7 | **186** |
| 5 | SN5 | RN5 | SRN5 | 42.191081 | 69.820373 | 4G | Yes | 6.3 | **178** |
| 6 | SN6 | RN6 | SRN6 | 42.22219 | 70.074663 | 3G | Yes | 6.2 | **89** |

https://connectschools.online/

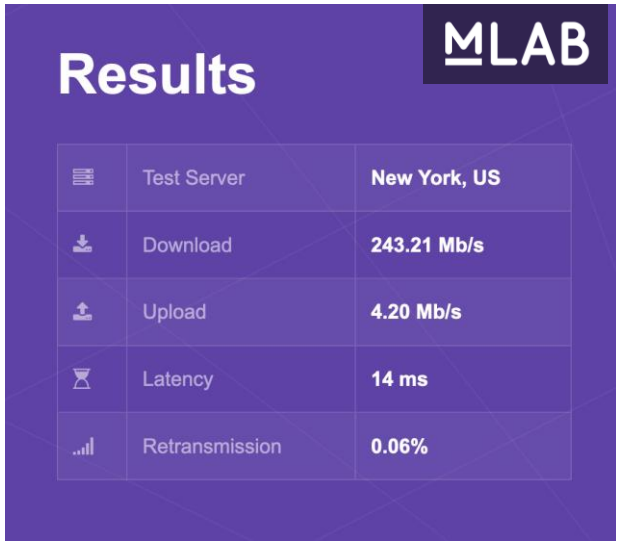
# Processing calculation results

**Why**:  to consider out-of-model-scope cases
**What**: specific cases
**How**: expert advise

**Tools**: LMC Guide, best practices database, pool of experts

# Real-time monitoring system

**Why**: to monitor connection usage efficiency and combine with EMIS data to improve learning processes
**What**: traffic measurements
**How**: ISPs' billing data, on-site software, on-site hardware probes, shared databases
**Tools**: M-Lab, etc.

# Thank you!

Contacts:

Ihar Shchetko
Giga Project Officer in Central Asia
ihar.shchetko@itu.int