

# *Plans for 5G Implementation in Serbia*

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# *Talk overview*

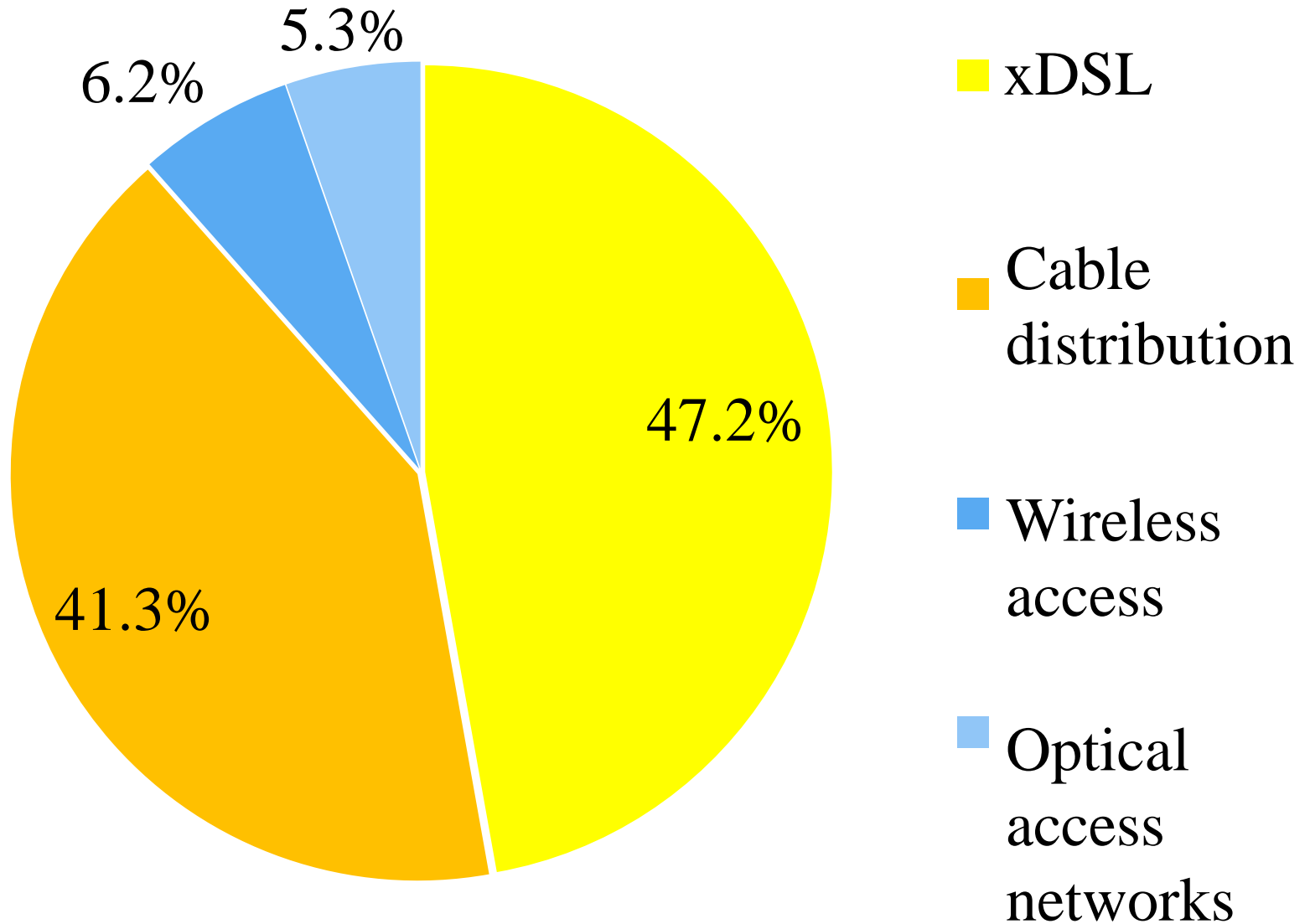
- ICT Indicators
- Technologies for future:
  - ✓ 5G
- Spectrum needs

## *ICT index – IDI for Serbia – the 55<sup>th</sup>*

Economy: SERBIA				
	Key indicators for 2016		Europe	World
1	Fixed telephone sub.per 100 inhab.	35,25	37.7	13.6
2	Mobile-cellular sub. per 100 inhab.	123.32	118.0	101.5
3	Fixed-broadband sub. per 100 inhab.	24.29	30.2	12.4
4	Active mobile-cellular sub. per 100 inhab.	67.4	80.1	52.2
5	3G coverage (% of population)	99	98.5	85.0
6	LTE/WiMAX coverage (% of population)	95	92.2	66.5
7	Mobile-cellular prices (% GNI pc)	3.3	1.0	5.2
8	Fixed broadband prices (% GNI pc)	3.3	1.2	13.9
9	Mobile-broadband prices 500MB (% GNI pc)	1	0.6	3.7
10	Mobile-broadband prices 1 GB (% GNI pc)	1.2	0.6	6.8
11	Percentage of household with computer	74	79.6	46.6
12	Percentage of household with internet access	66.82	82.5	51.5
13	Percentage of individuals using the Internet	67.1	77.9	45.9
14	Int. Internet bandwidth per Internet user (kbps)	26.3	178.0	74.5

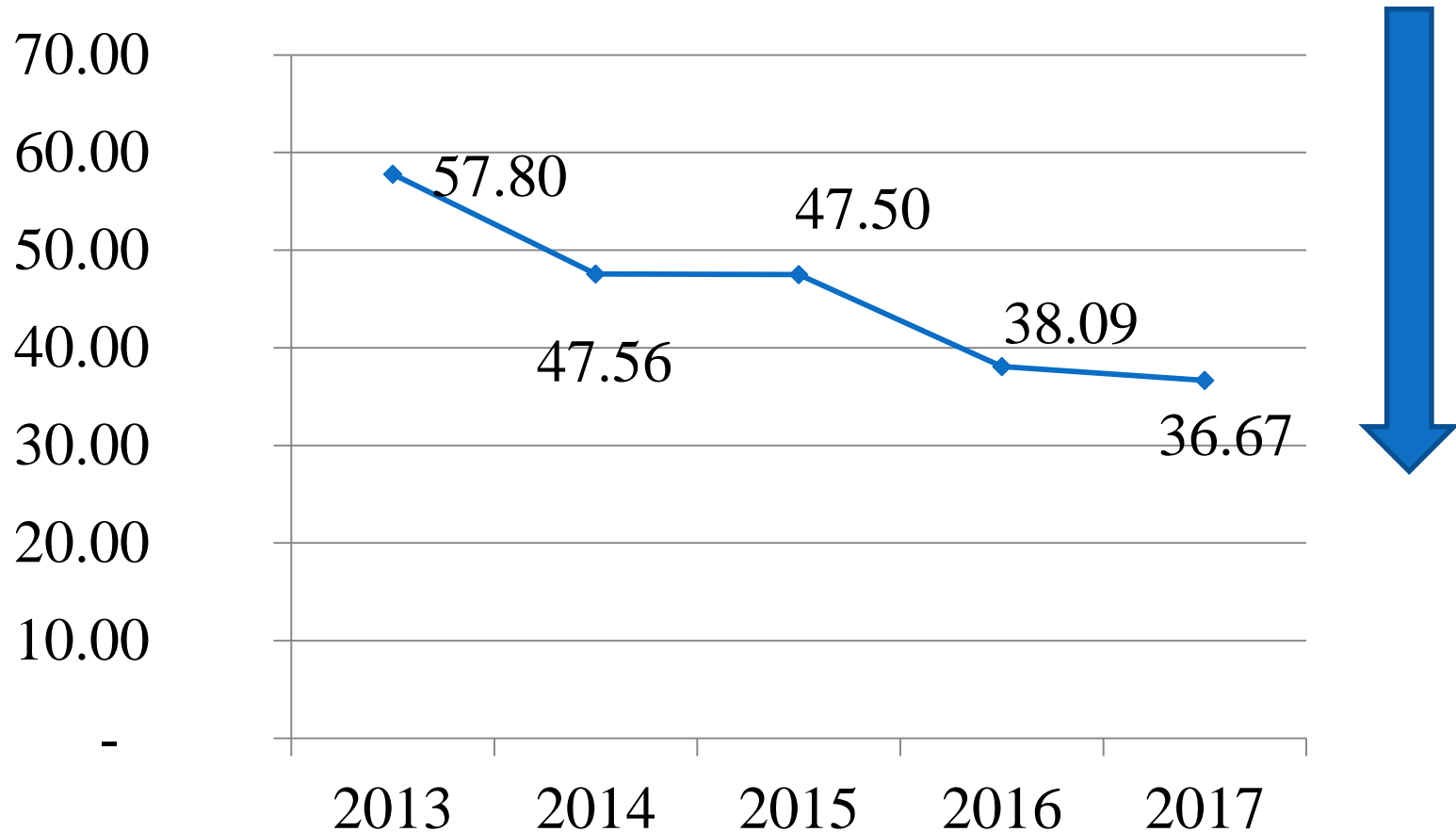
RATEL (data for 2016/2017)

## *Fixed broadband*



# *Income based on roaming in millions of Euros*

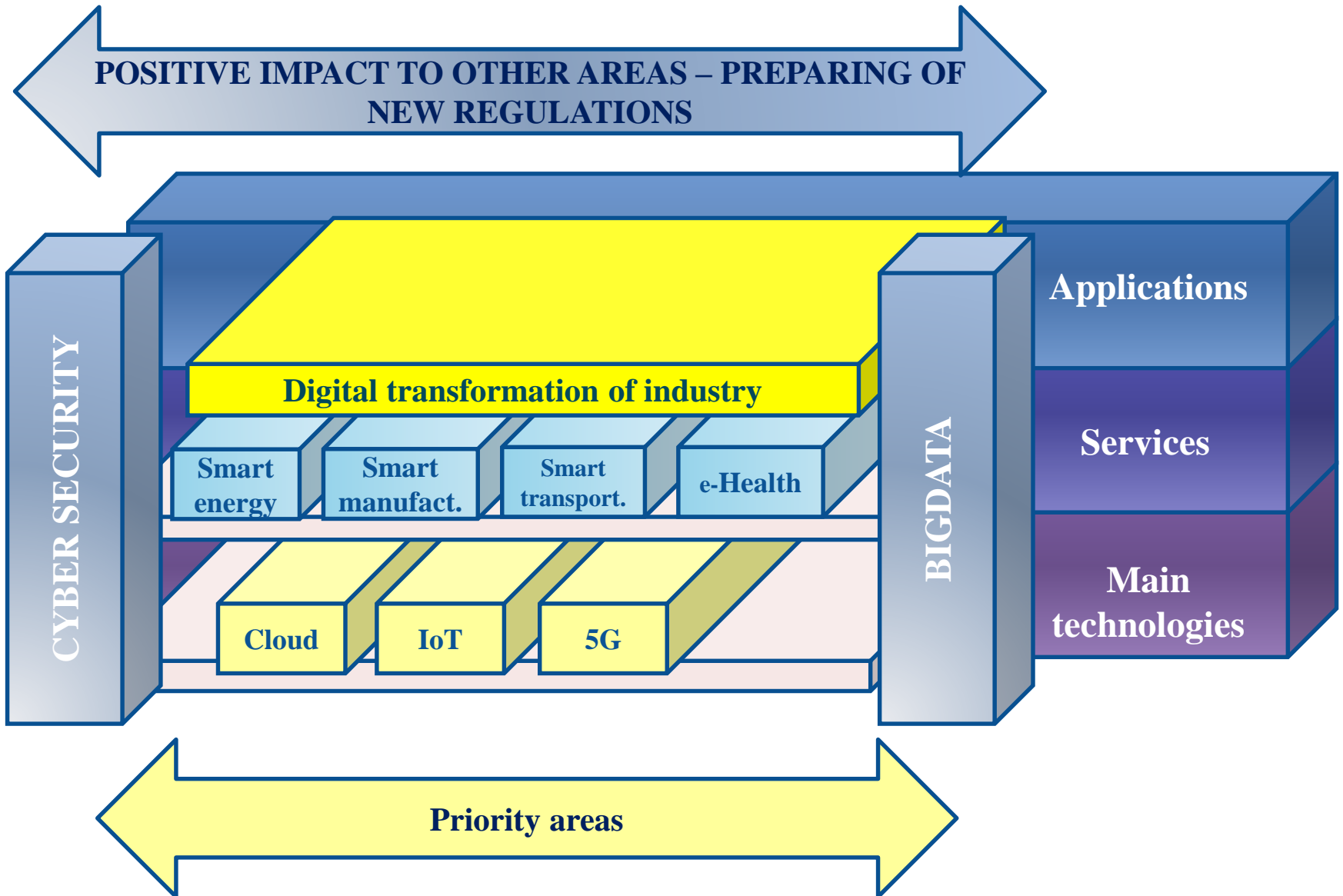
*It's going down: and we have a chance to abolish the cost*



## **Strategy for Development of New Generation Networks by 2023**

*Main goal: to prepare the environment for Digital Single Market implementation*

# *DSM layers*



The European Commission has established five key blocks for the development of the *digital single market*:

- Cloud Computing (*IaaS, PaaS, SaaS*);
- Internet of Things (*IoT applications are capable of getting connected to, gathering, generating smart data and information and use them in digital services without any human interaction*);
- Big Data- Four Vs of Big Data (*Volume, Variety, Velocity, Veracity*);
- 5<sup>th</sup> generation of mobile networks (5G);
- Cybersecurity.



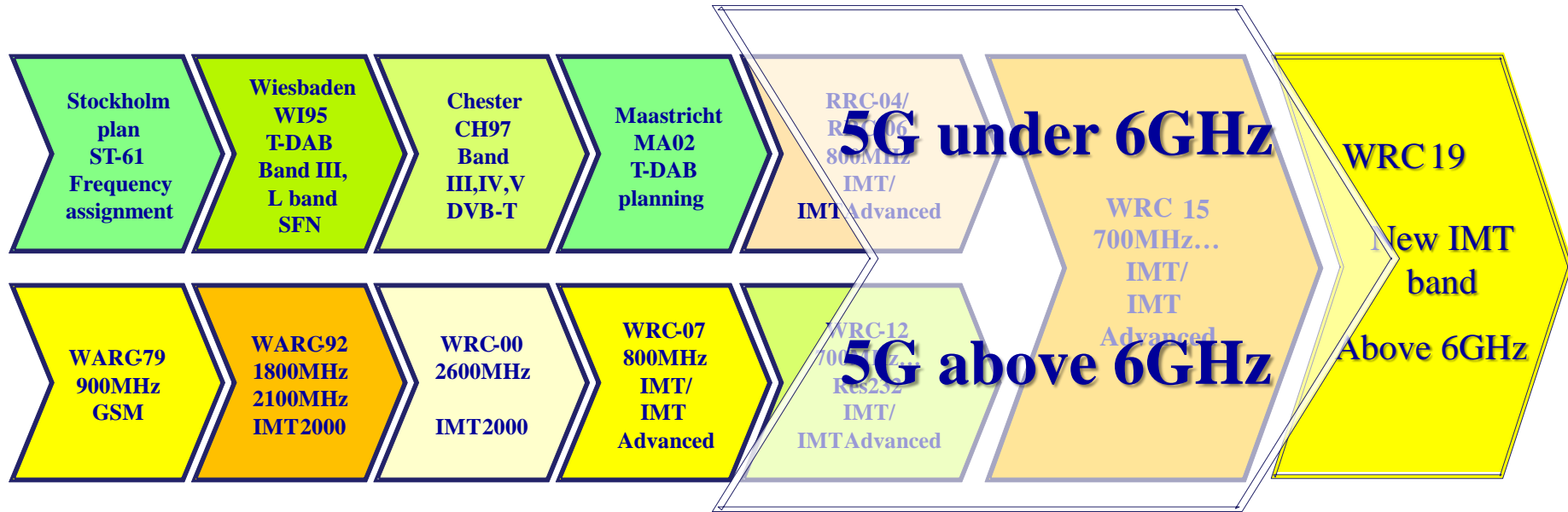
*The 4<sup>th</sup> Industrial Revolution*

*5G is revolution by itself*

*The most important pillars of the 5G systems:*

- 1. Evolution of the existing radio frequency technologies - minimising latency, as well as supporting flexible, shared use of the wireless access networks.*
- 2. Hyper dense small-cell deployment*
- 3. Self-organising network (SON)*
- 4. Machine type 5G.*
- 5. Redesigning Backhaul*
- 7. Energy efficiency*
- 8. Allocation of New Spectrum for 5G*
- 9. Spectrum sharing*

# *From 5% of radio frequency spectrum - towards 5G*



## *5G – requirements*

- The spectrum requirement for 5G networks is seen today in two directions:
  - the frequencies under 1GHz
  - the frequencies above 6GHz.
- The spectrum bandwidth estimated per operator could be:
  - ~500MHz below 20GHz,
  - ~1GHz between 20-40GHz and
  - ~2 GHz above 40GHz.

The harmonization of spectrum policies for 5G is a challenge.

*Plans for 2019/2020:  
Auction for 3.4-3.8 GHz band*

*Plans for 2020/2021:  
Auction for 700 MHz band*

*Common for development of Cloud computing,  
IoT and 5G is the necessity for the  
**Fiber Network Availability***

Thank you for the attention!

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