"The Polish experience regarding collecting the data on telecommunications infrastructure.

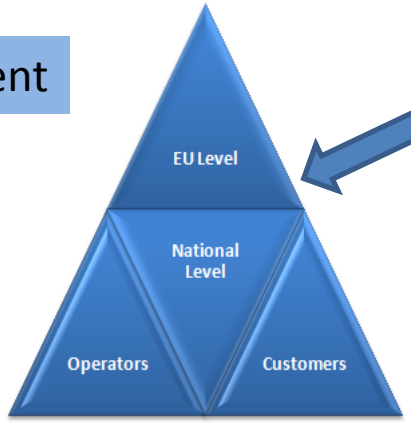
Presentation for the participants of the European RPM WTDC-14 Belgrade, 27th November 2013"

Rzeczpospolita Polska

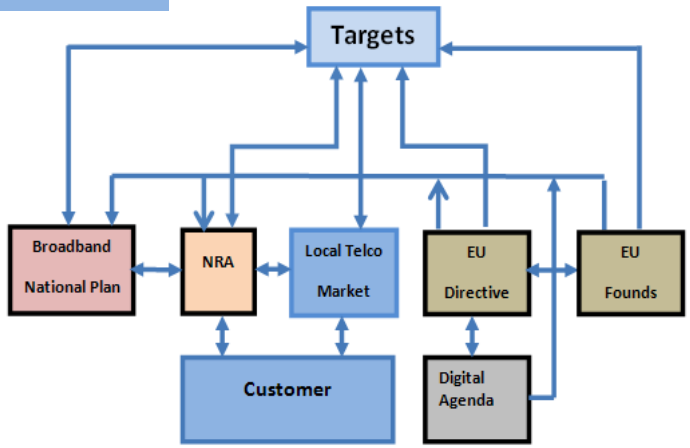
Urząd Komunikacji Elektroni

How create System vision/idea ?

Environment



Relations



START

Needs/Target to achieve

Understand the limitations, possibilities, needs of two sides of process:

Information/data suppliers

- Network providers (telco, utility)
- Service provider (on own network, virtual)
- Content providers

Demand side

- Government
- NRA
- Organizations
- Business
- Customer (-business, residential others)/potential customer

Understand for whom information is needed, necessary. Where is critical?

Best Practice

- Reports
- Recommendations
- Analyses of successful system implementation

System vision

Legal Environment

- Voluntary agreement of both side
- Dedicated National Low Act
- EU Directive
- NDA (Non-Disclosure Agreement)

Funding source

- Public Founds/Grants
- Commercial Founds

Decision

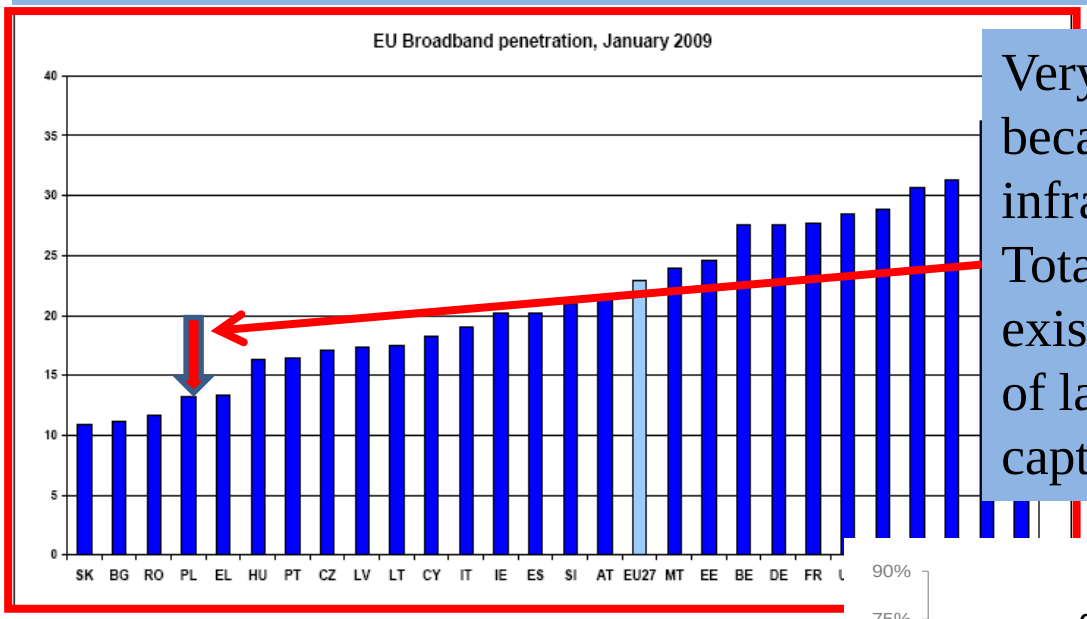
Communication policy for process participants

- Identify and generate acceptable awareness for the project
- Manage public expectations of the project scope and targets
- Educate benefits of broadband mapping

Polish targets and needs

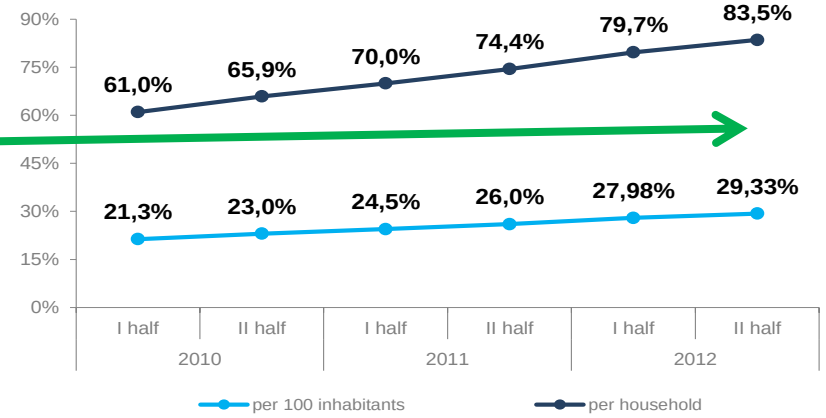
Why did we decided to thing about mapping of telecom infrastructure and create dedicated law few years ago ?

The main reason was...



Very low Internet penetration because of lack of infrastructure
Total lack of information about existing infrastructure because of lack of NRA delegation to capture such information

Now is much better but we have to still chase Europe



Source: UKE

Other reasons :

- increase investment in the telecommunications sector;
- accelerate investments co – financed by EU funds;
- removal of barriers to investments in telecommunications infrastructure;
- accelerate the construction of new generation networks (NGA/NGN).

❑ The realization of these demands is the reason for adoption of:

The Act of 7 May 2010 to promote of the development of telecommunications services and networks, called Broadband Act.

Article 29 of the Broadband Act

- Provides a legal basis of drawing up the inventory of existing telecommunications infrastructure and public telecommunications networks on the territory of Poland (in electronic form) with a separate indication of coverage of the country by:

  - optic links;
  - wireless networks;
  - building to enable collocation.

- Obligated to forward the President of the OEC of data on telecommunications infrastructure are :

  - state and local government entities (with exceptions);
  - public utility units;
  - telecommunications companies;
  - Chief Land Surveyor.

- Commits to ongoing review and update the inventory, not less frequently than once a year.

Pursuant to Article 29 section 7of Broadband Act Minister of Home Affairs and Administration issues: ***Regulations of the 28 January 2011 on the inventory of existing telecommunications infrastructure and public telecommunications networks***, which defines:

- The scope of the information collected through the inventory;
- The scope of the inventory data published in **the Information Broadband Infrastructure System**;
- The detailed scope and manner of presentation of inventory – inventory maps:
  - route of backbone and distribution telecommunications networks, indicating the type of technology which has been used;
  - location of telecommunications hubs,
  - location of transmission systems,
  - location of points of contact between the public telecommunications network;
  - location of collocation buildings;
  - location of other existing telecommunications infrastructure, indicating the type of technology which has been used.
- The method of date delivery to the President of the OEC.

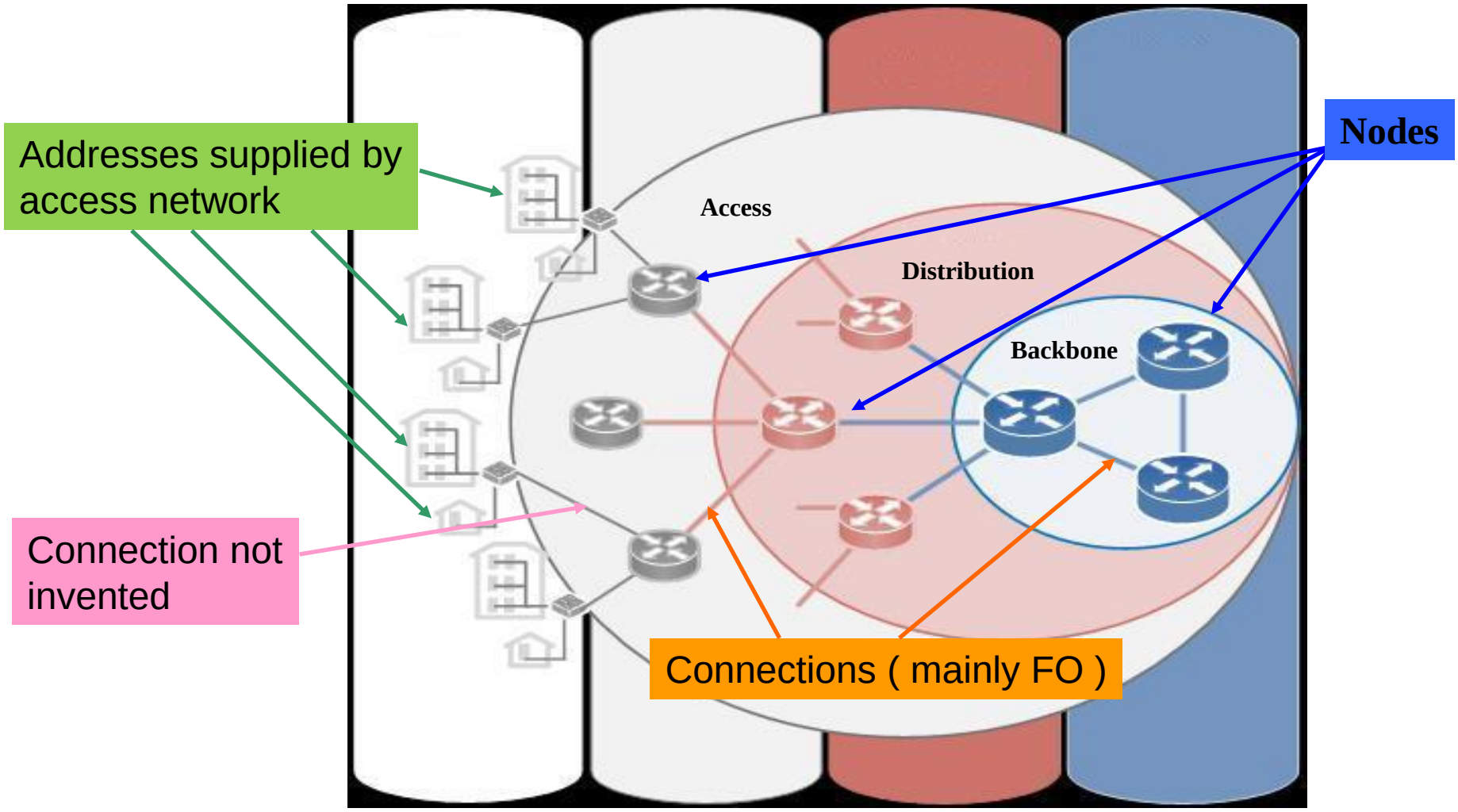
The Information Broadband Infrastructure System (SIIS)

- It's a computer system for gathering, processing, presentation and share information about telecommunications infrastructure, public telecommunications networks and buildings to enable collocation;

- implemented within **The Information Broadband Infrastructure System Project** and **Poland Broadband Portal** (**SIPS**). The Project is implemented by:
  - Institute of Communication (Polish research unit),
  - Office of Electronic Communication
  - Ministry of Infrastructure (currently Ministry of Administration and Digitalization)

  and is funded by the 7th priority axis of the Operational Programe Innovative Economy 2007 - 2013 ;

Network model



Definitions -1

- **Backbone network** - top layer of a public telecommunications network, aggregating traffic from the lower layers of the network;
- **Distrybution network** - public telecommunications network layer, connecting the backbone nodes of a telecommunications network w aggregating traffic from end-users of telecommunications access network nodes
- **Access network** - the lowest layer of the public telecommunications network that links telecommunication traffic aggregation points of the telecommunications terminal equipment. The point of aggregation may be an Ethernet switch, DSLAM, ONU, ONT or base aggregate traffic from the terminals

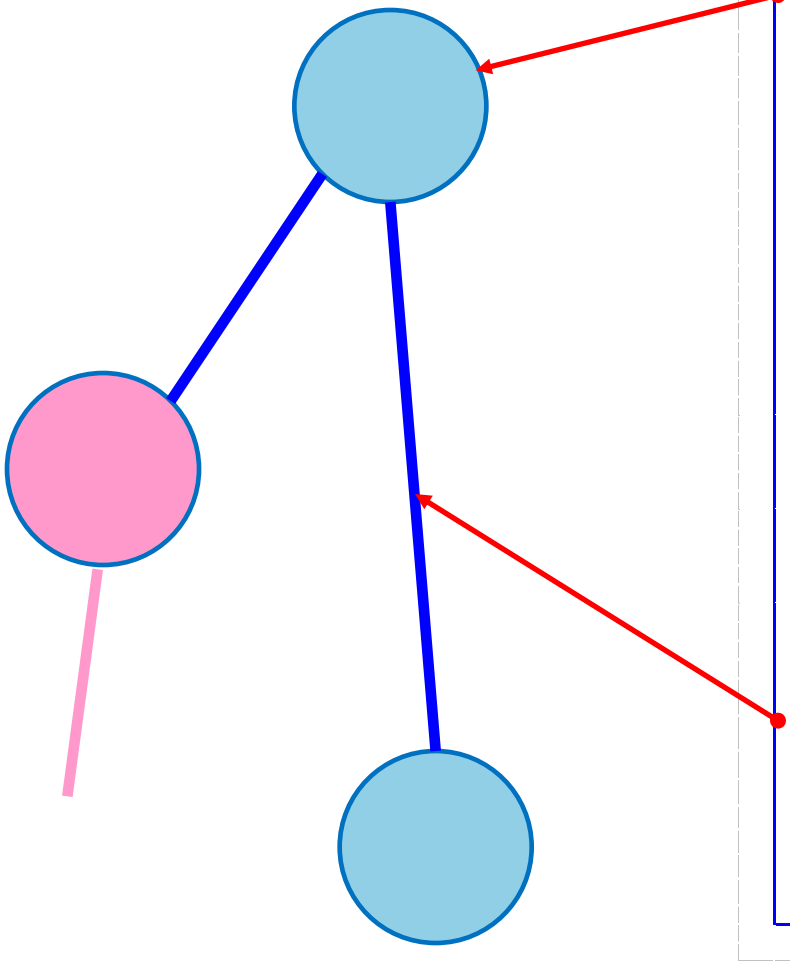
Application allow to assign to one node all combination of network layers

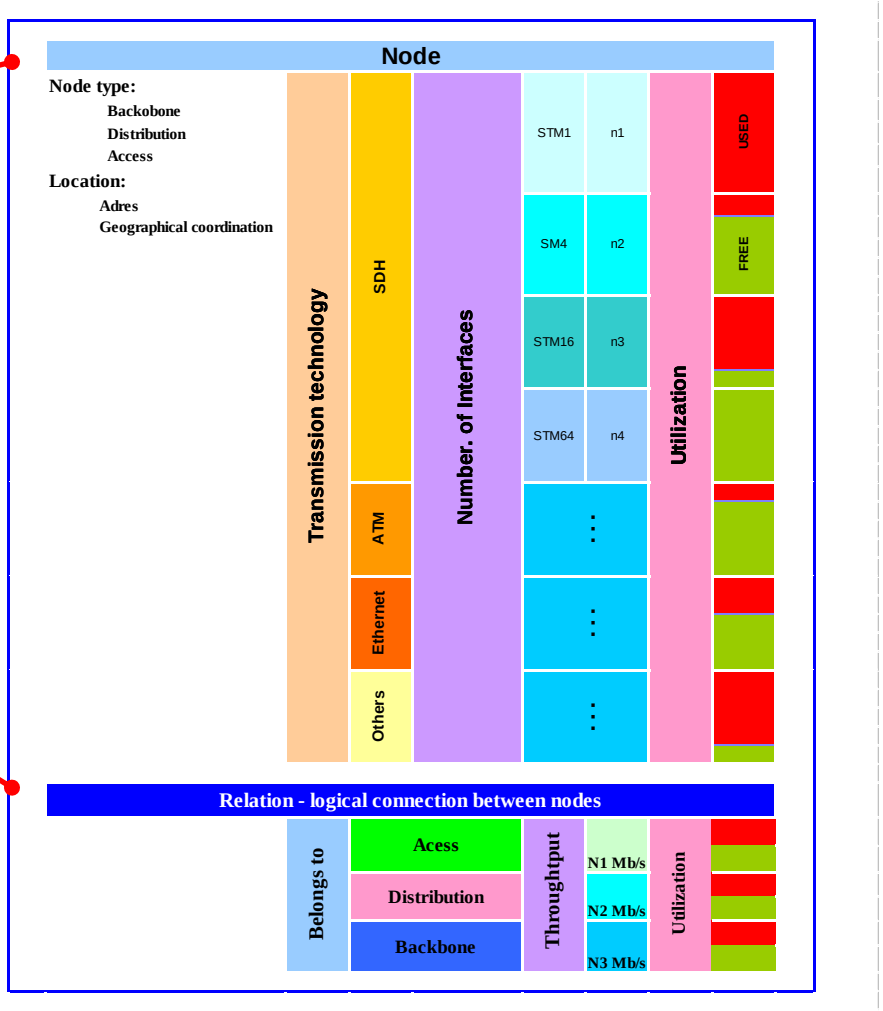
Definitions -2

Telecommunications network node - a device or group of telecommunications equipment, providing the physical connection of telecommunications networks or connection of end users.

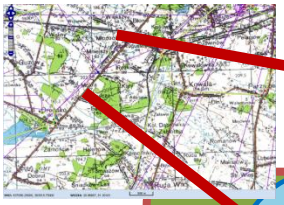
- Each location of the active infrastructure can be divided into smaller fragments as the network nodes so that the equipment belonged to one type of network.
- Node can have three types of network feature which can be simultaneously access, distribution and backbone network
- Small networks may not have nodes in the network backbone and search for them on the "strength" is not necessary.
- Backbone networks typically have a range of more than regional
- Each operator defines which parts of network belongs to the specified type. It is important that, once adopted, the rule applied consistently for the entire network

Nodes and logical relations





Fiber network model



Optical cable length

Junction e.g. splice for FO)
(geographical coordination)

Number of pairs

Utilization

Node A

Node B

Logical Relation

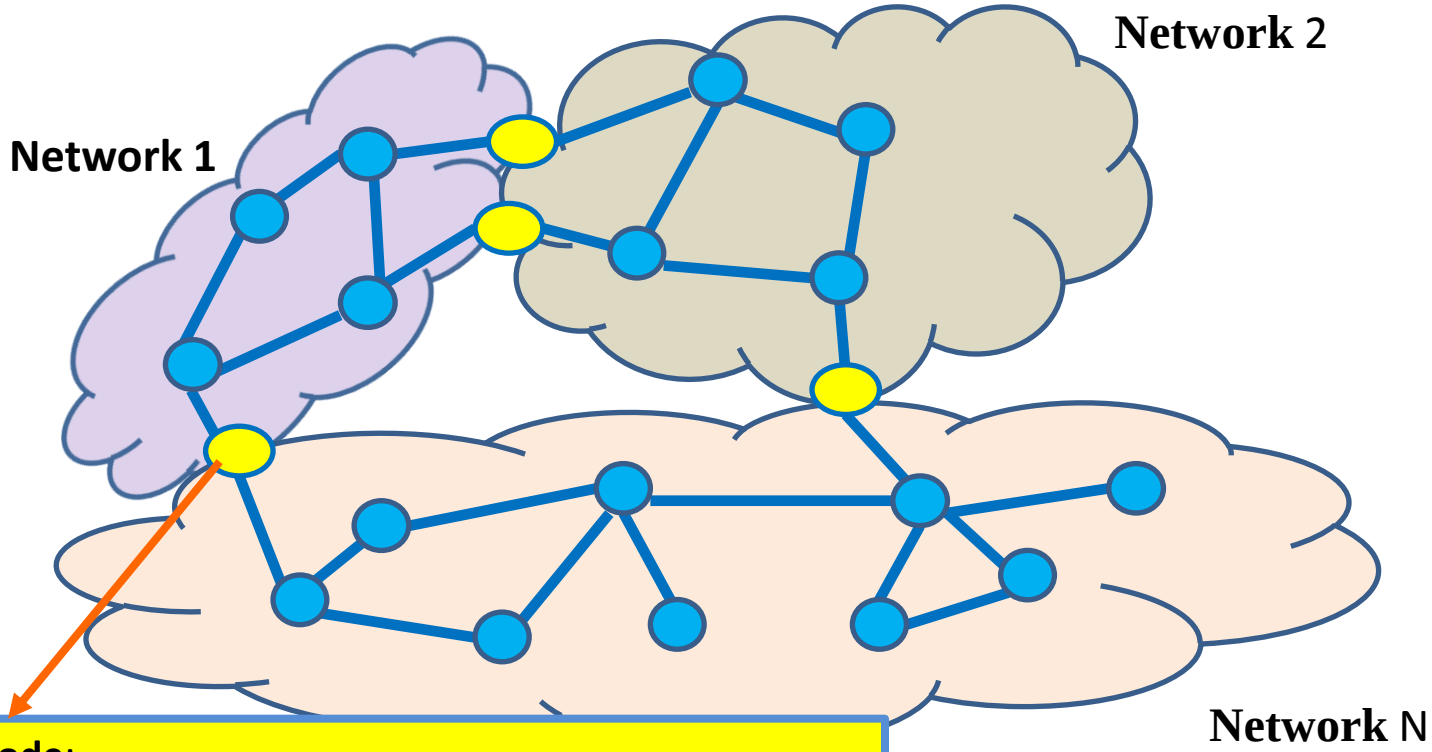
Lease possibility
- YES / NO
- No. of pair to lease

Type of location:
- Building
- Cabinet
- Tower
- Mast
- …..

Collocation building
Ability to collocate,
technical information
like : power, airconditon etc.

Node C

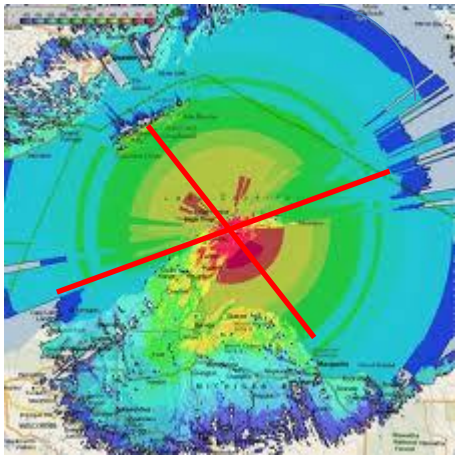
Connection between networks

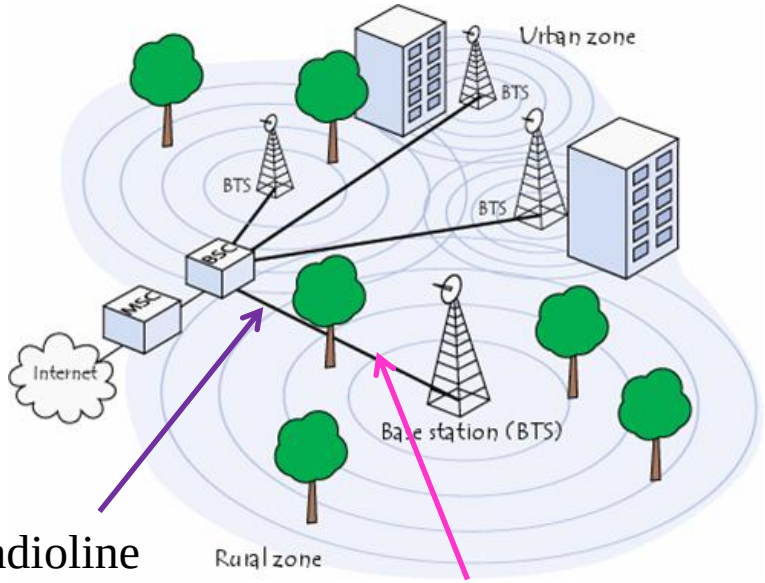


Interconnect Node:
- Location (address)
- Transmission Medium (FO, RL, Cable ...)
- Transmission technology (ATM, SDH, PDH, Ethernet …)
- Throughput

Radio network model

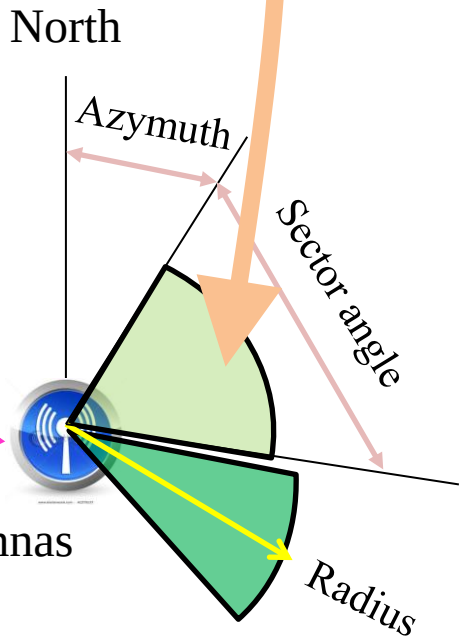
Replacement





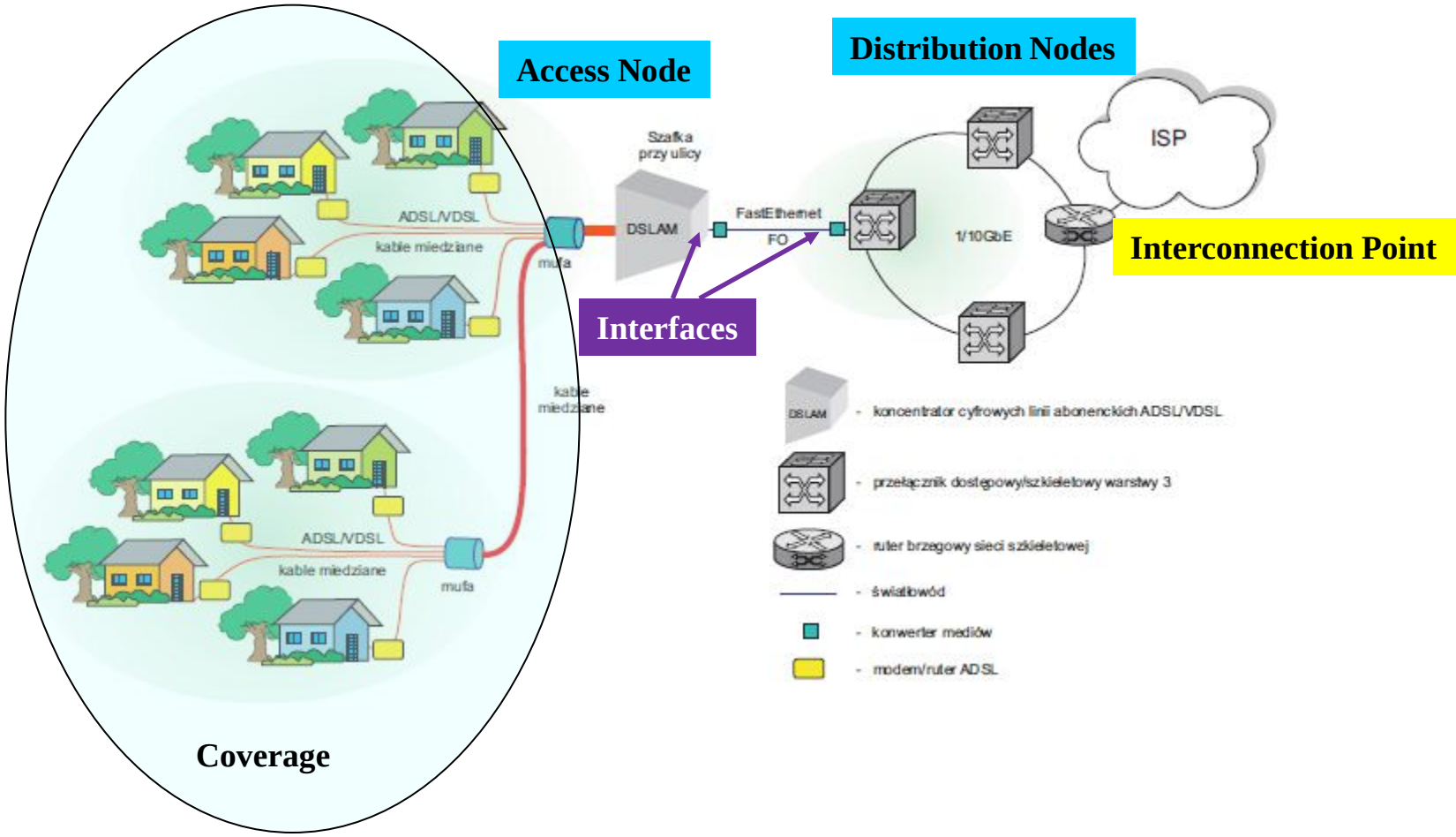
Radioline

Geographical coordination of BTS

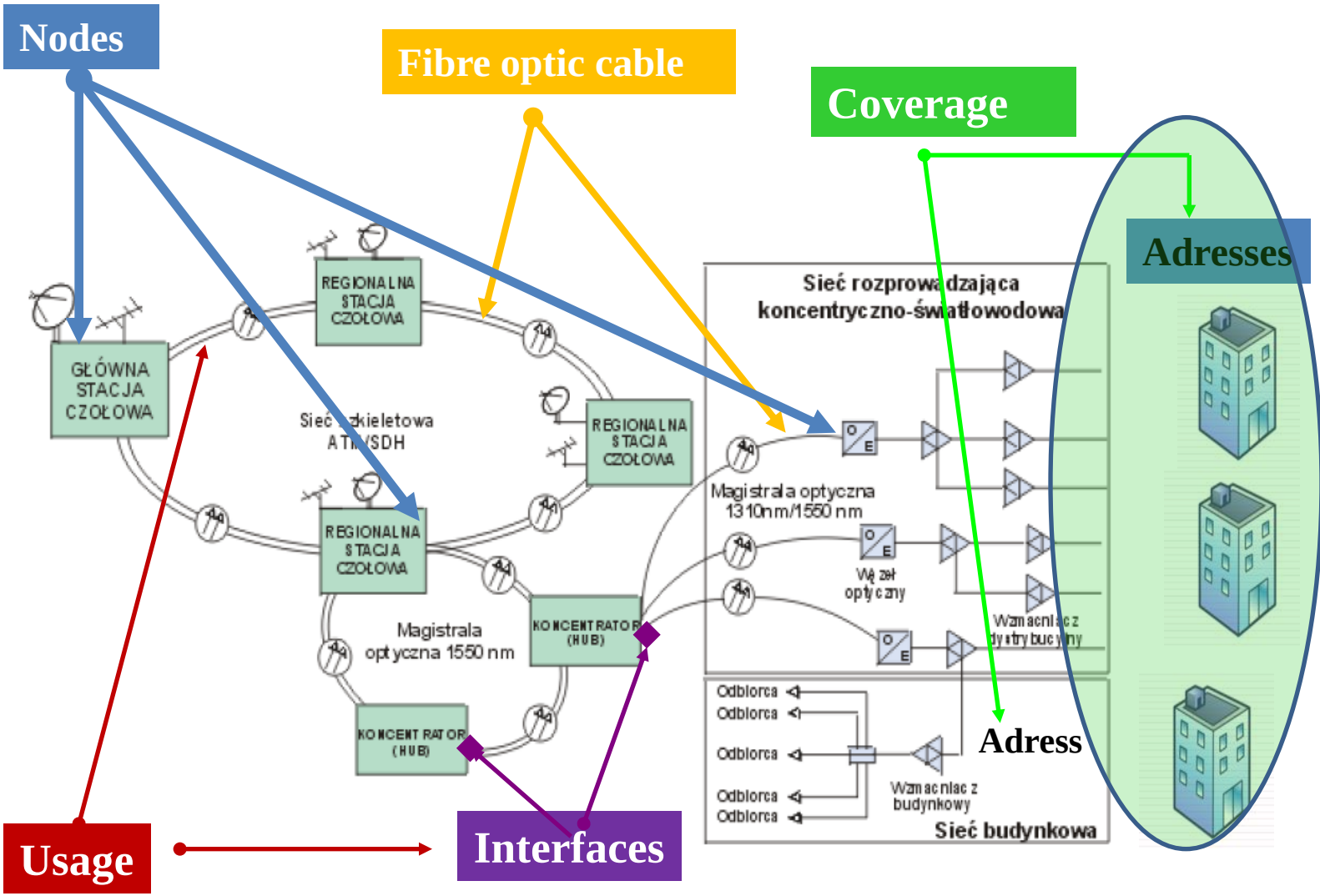


BTS with sector antennas

FTTH – Ethernet –xDSL network examples versus network model



CATV - HFC


Nodes
Fibre optic cable
Coverage
Adresses
GŁÓWNA STACJA CZOŁOWA
REGIONALNA STACJA CZOŁOWA
REGIONALNA STACJA CZOŁOWA
REGIONALNA STACJA CZOŁOWA
Sieć szkieletowa ATM/SDH
Magistrala optyczna 1550 nm
KONCENTRATOR (HUB)
KONCENTRATOR (HUB)
Sieć rozprowadzająca koncentryczno-światłowodowa
Magistrala optyczna 1310nm/1550 nm
Węzeł optyczny
Wzmacniacz dystrybucyjny
Odbiorca
Odbiorca
Odbiorca
Odbiorca
Odbiorca
Wzmacniacz budynkowy
Sieć budynkowa
Adress
Usage
Interfaces

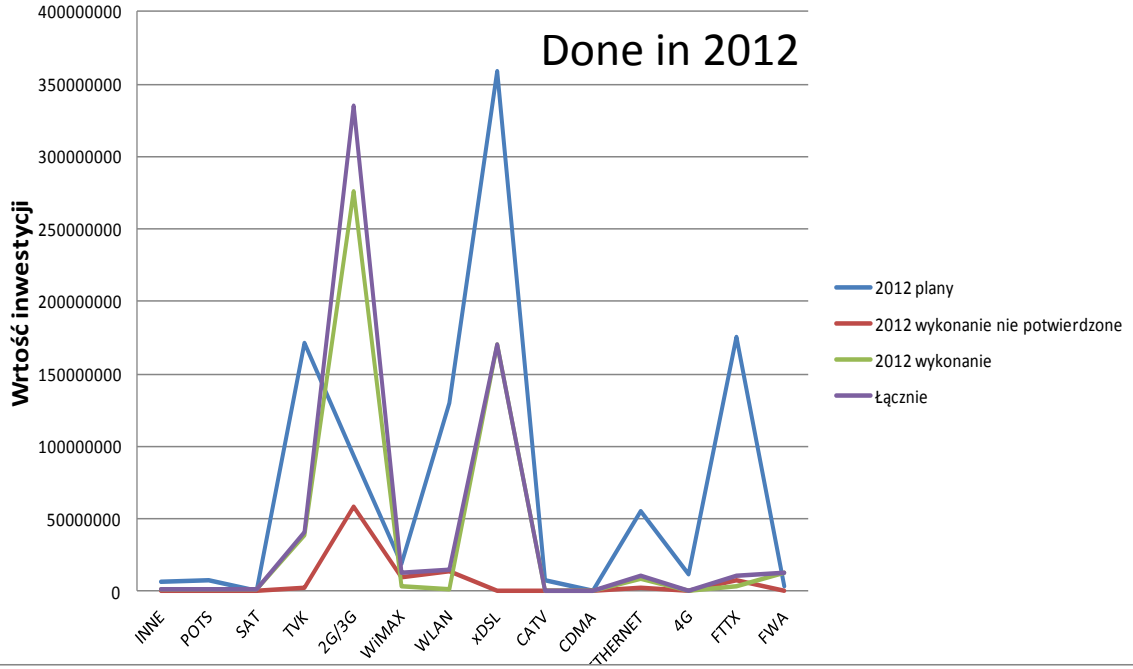
Information about investments

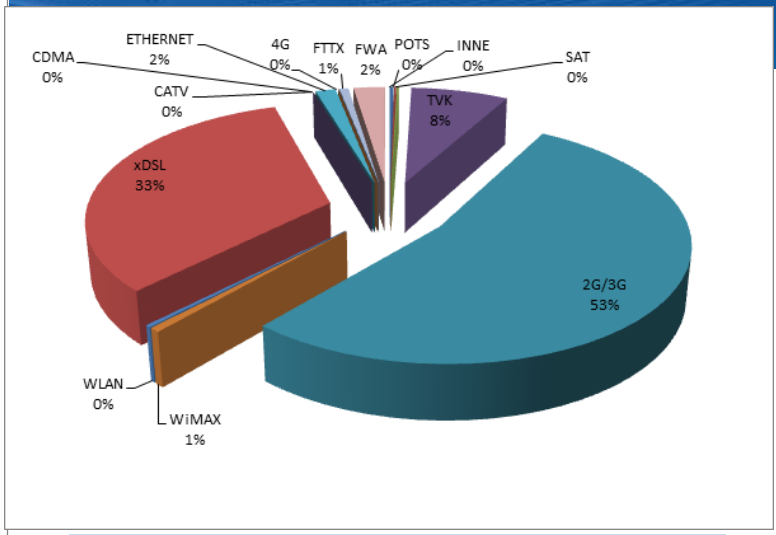
- **Access Network**
  - City-level of information
  - Current year and next year
  - Data divided on access technology:
    - Cable network like xDSL
    - Mobile (2G/3G)
    - LAN/WLAN
    - Ethernet
    - …..
- **Fiber optic lines**
  - Cable between A and B or A to A
  - Cable length
  - Number of pair
    - Free pair to lease
  - Level of EU fund

AIM – to discover investment trends in telecom market

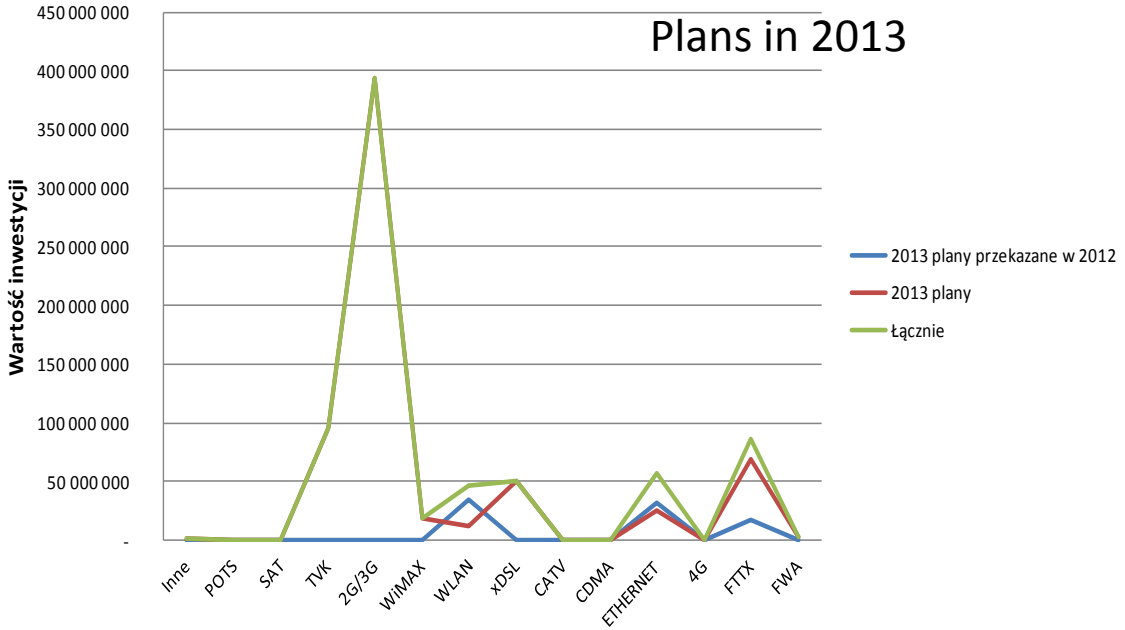
Trends

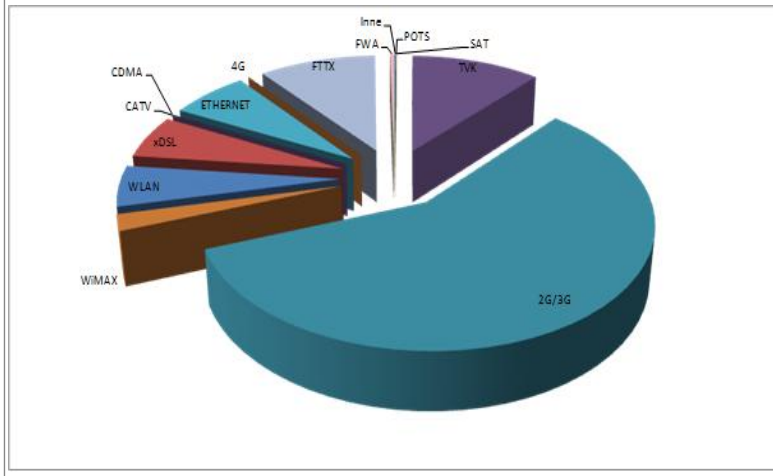
Investment in access networks





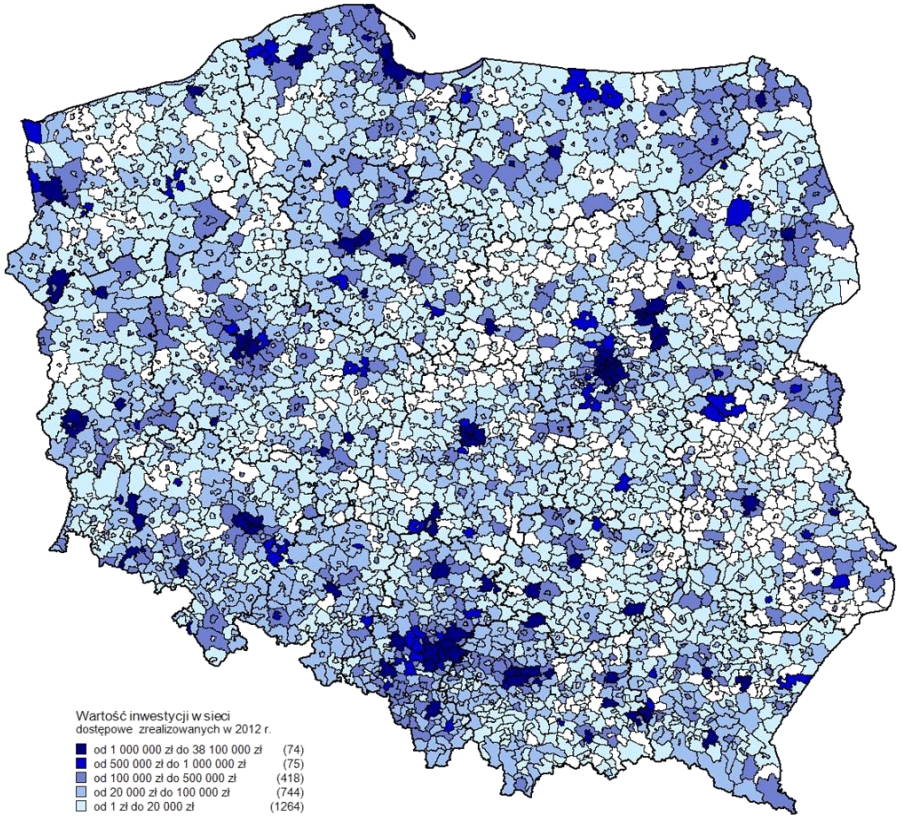
Percentage share of technology



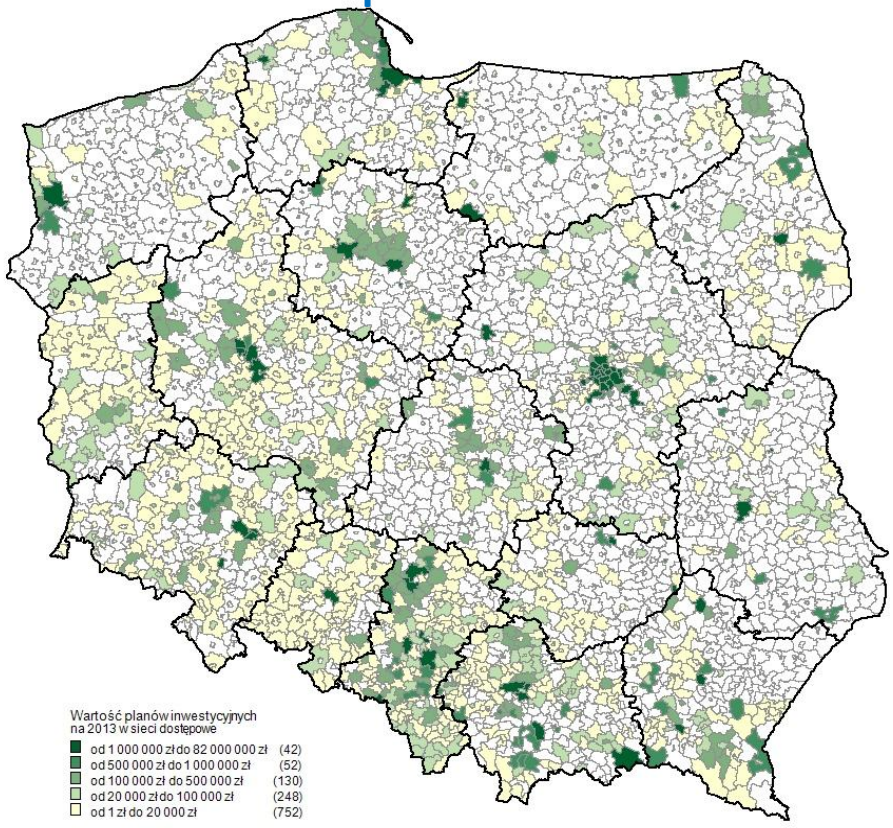


Access Network

Investment done in 2012



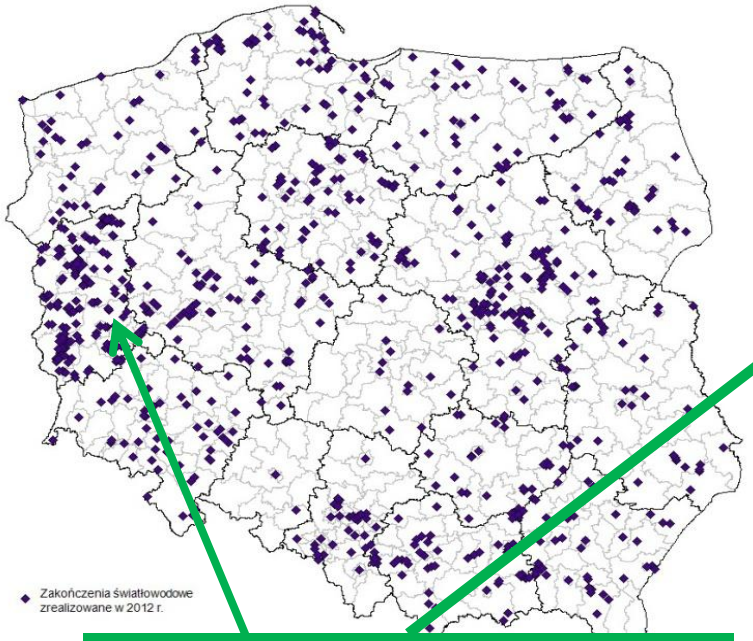
Investment plans 2013



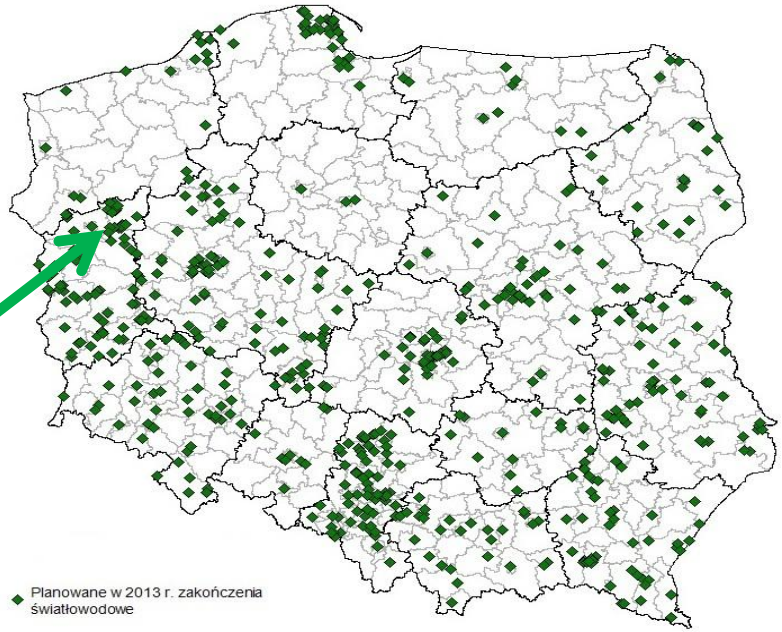
Visible investment movement into less urban areas but majority of the investment is around large cities

Fiber

The map shows towns and cities where broadband network terminations were built in 2012



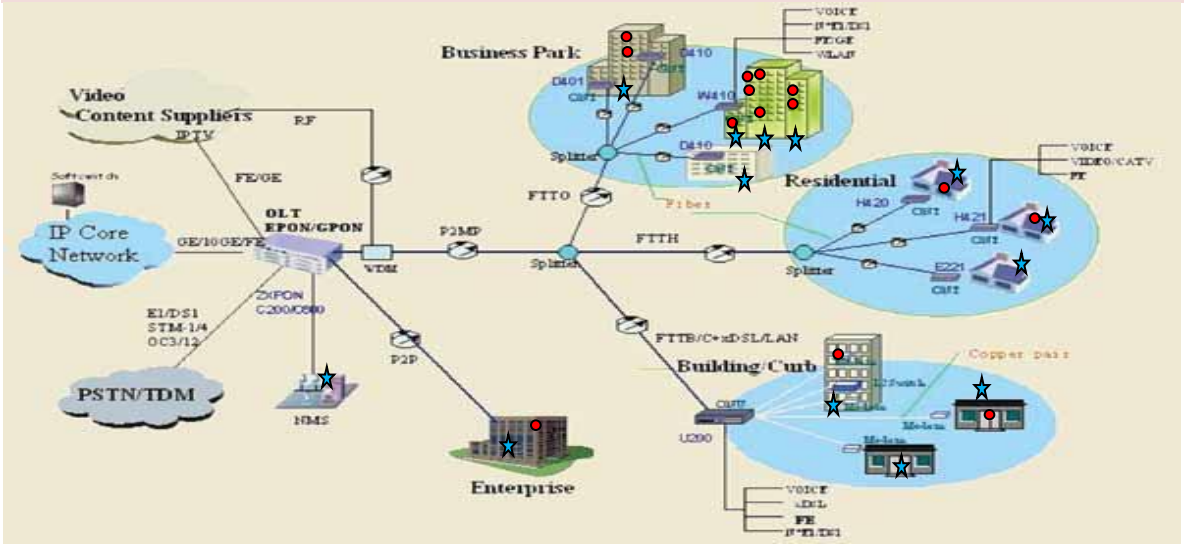
The map shows towns and cities where new broadband network terminations are planned to be build in 2013



High activity of TP-Orange.

Services

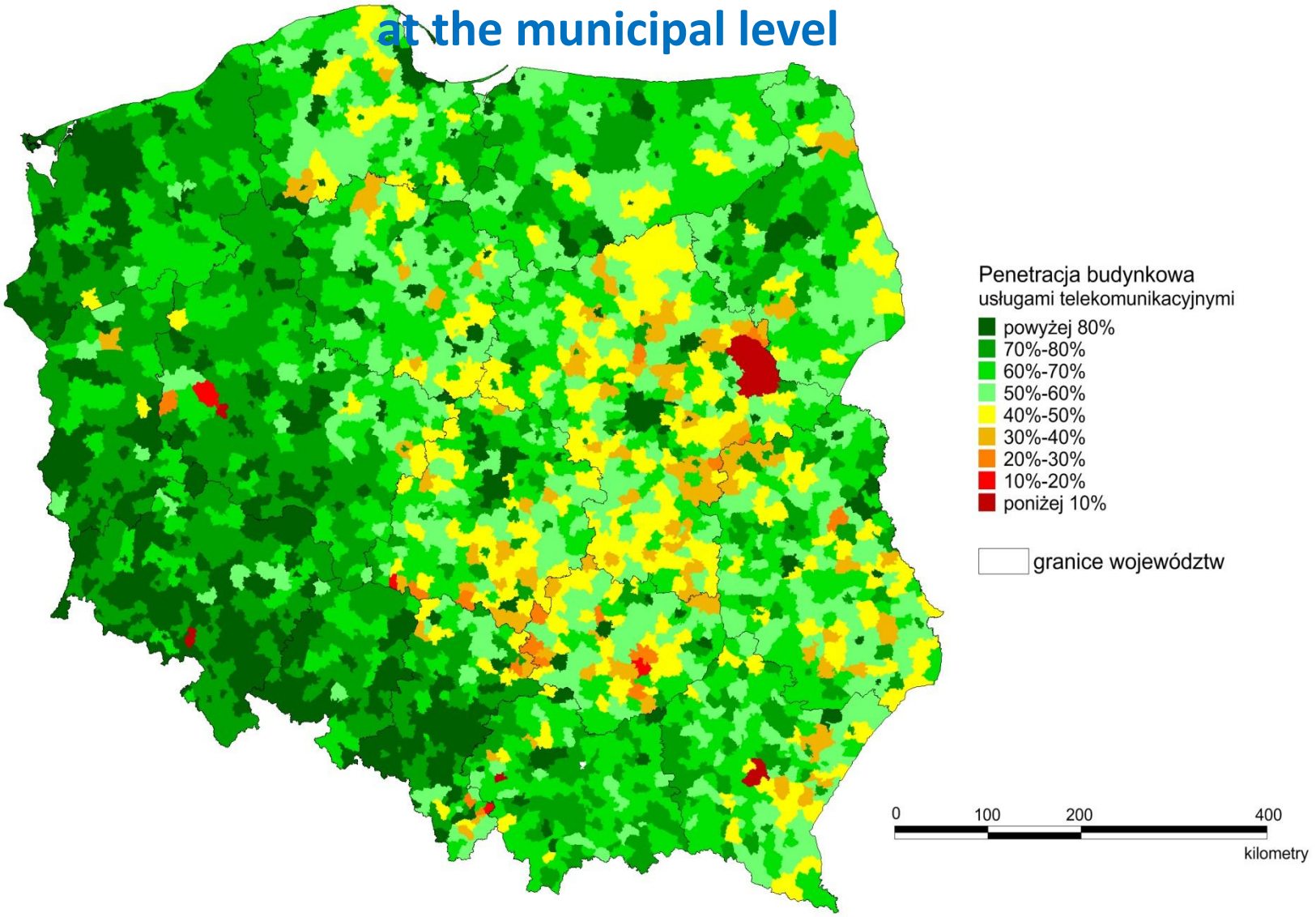
- **Information about Services broken on access technology assigned to the access node.**
  - Location of services on building level
  - Data are consistent with infrastructure data



- Sold services
- Coverage
- Addresses supplied by access network

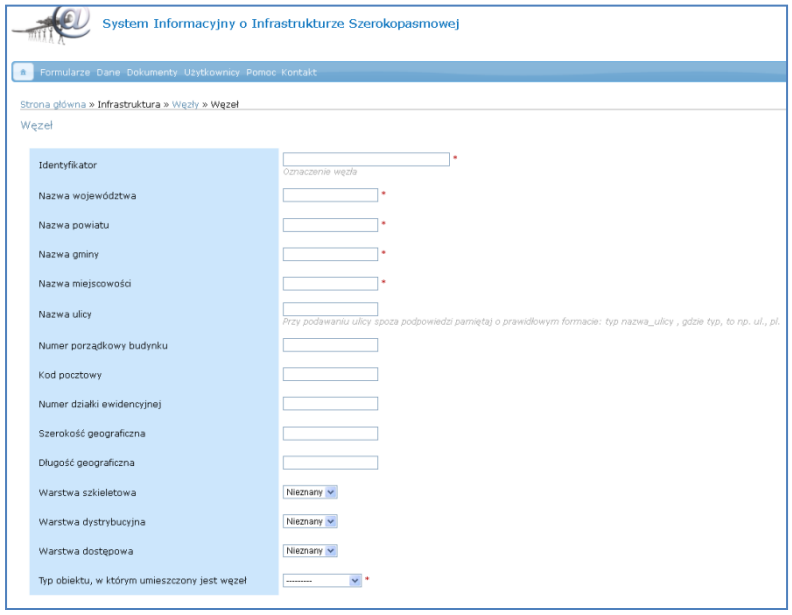
AIM – to localize dominant operator on defined level (part of city, city, community, etc.) to create useful for the market indicators (HHI, Internet penetration…) and made geographical market segmentation

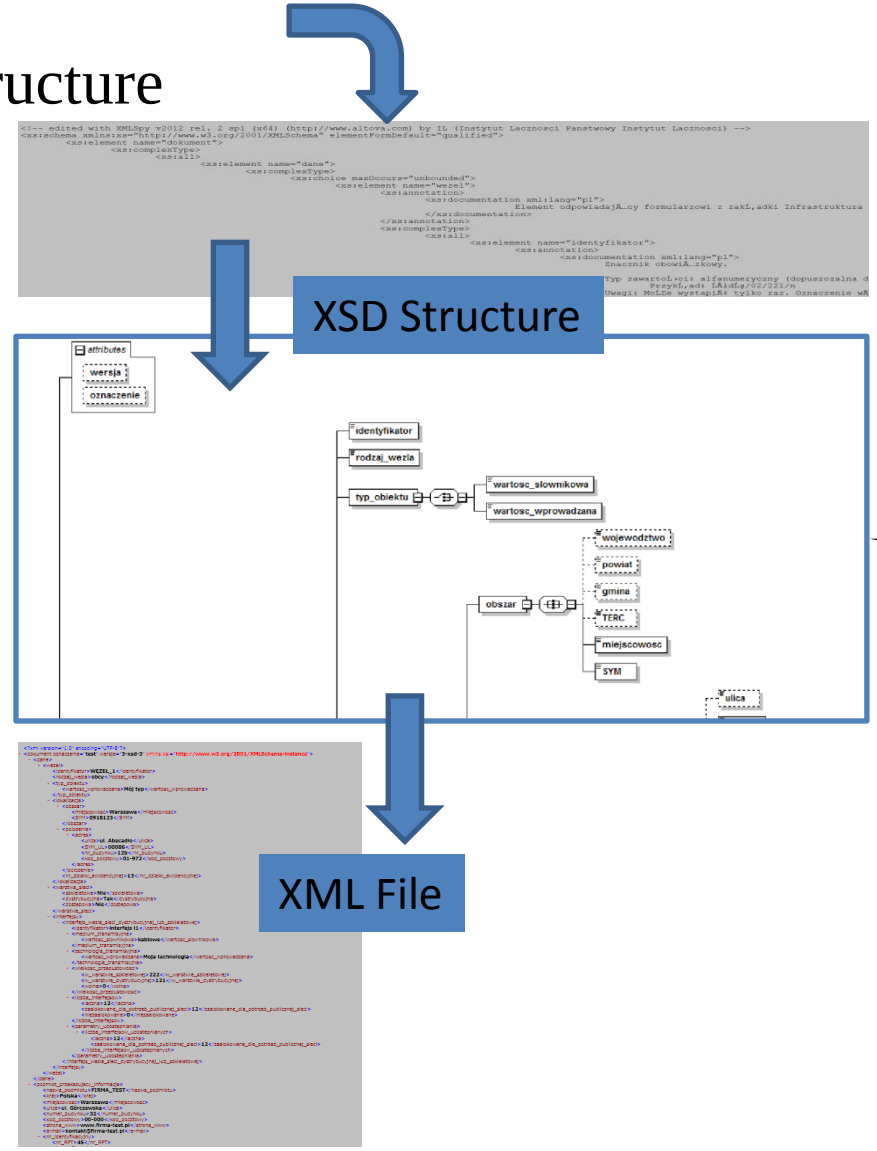
Penetration of Internet access service and voice service at the municipal level



Format of input data about infrastructure

- For big and medium telecoms
  - XML with detailed XSD structure
  - CSV files for biggest
- For small telecoms
  - Electronic form





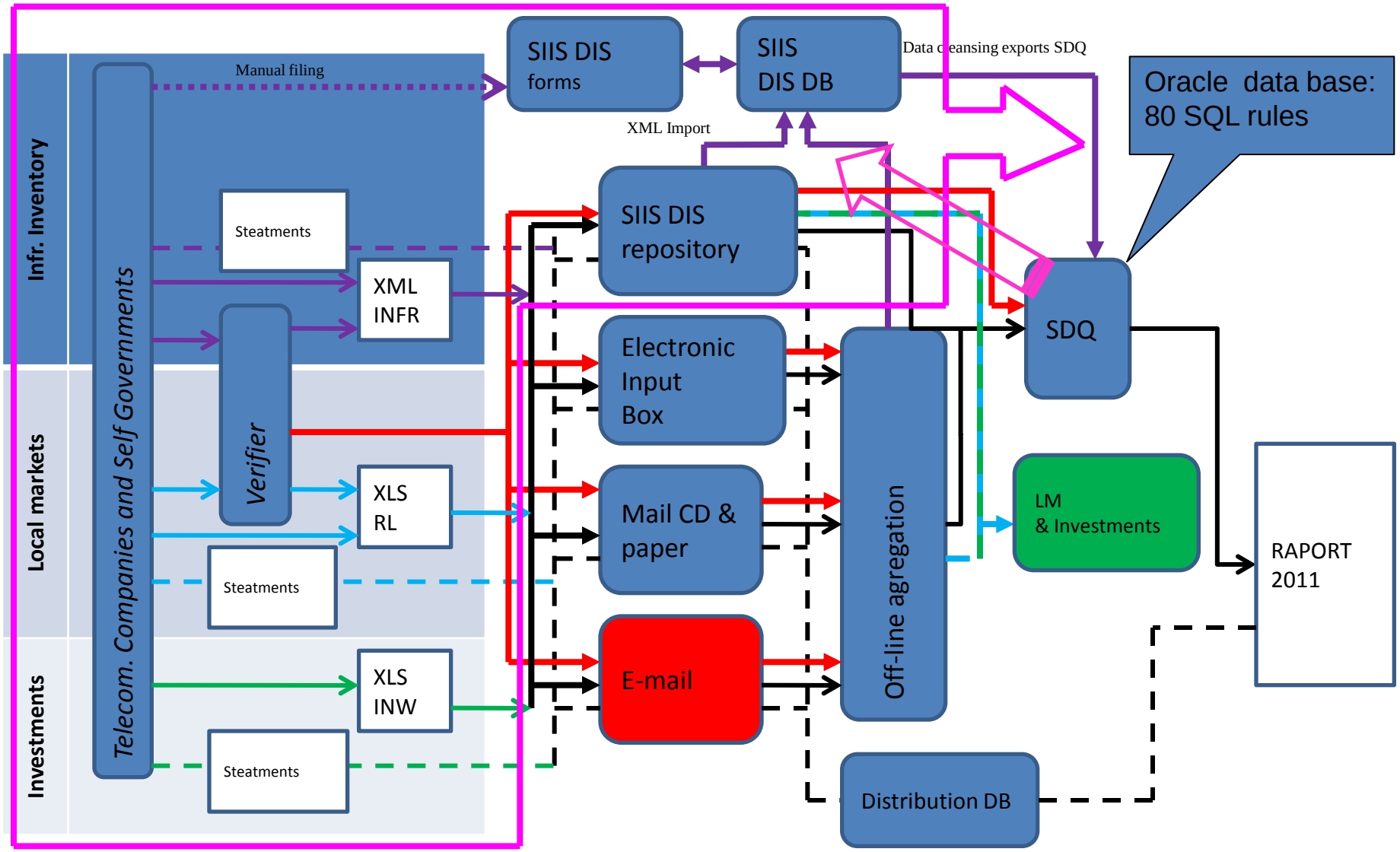
Data Capture process

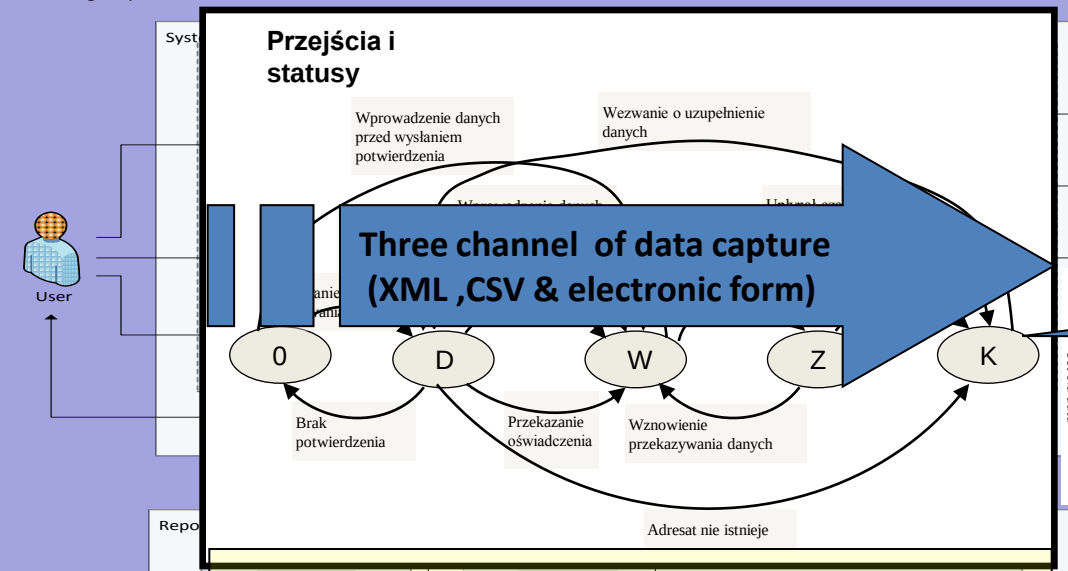
Initial version

Final version

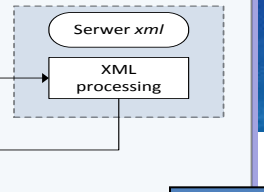
Quality data verification

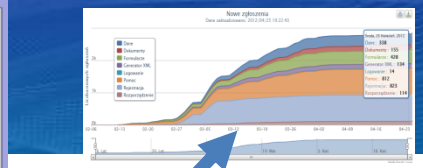
Communication channels and systems _initial version



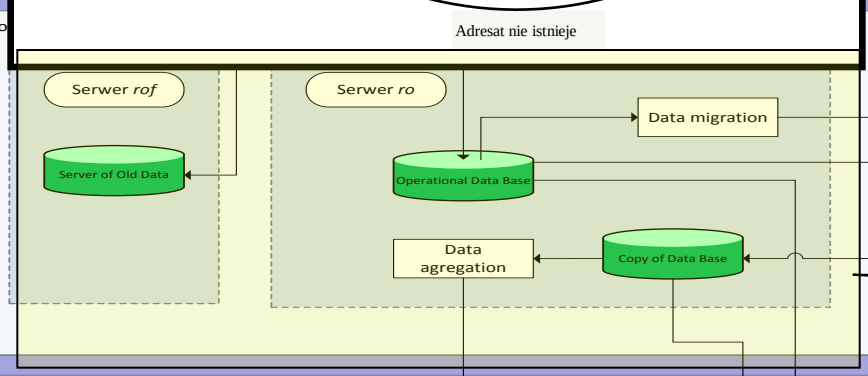


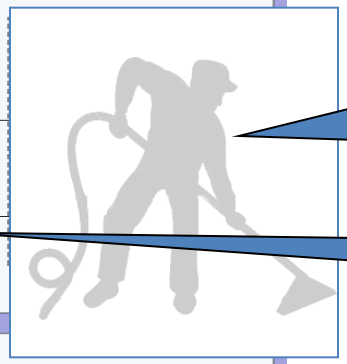
Three channel of data capture (XML ,CSV & electronic form)





„**Work flow**” for process status monitoring

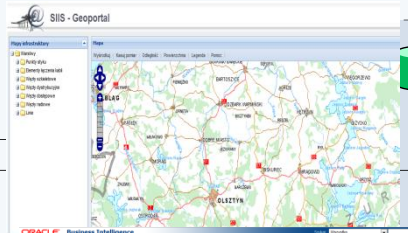


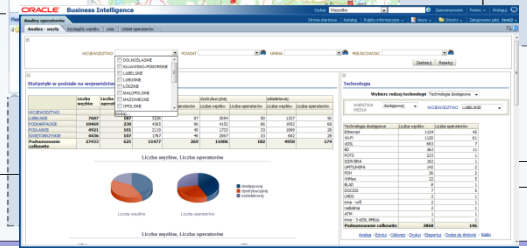


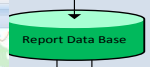
Built-in data cleaning rules plus extra level of data verification

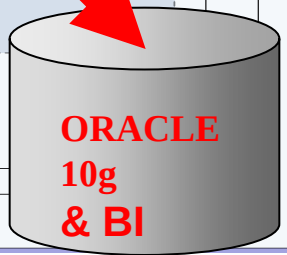
Current and historical data

System Raportowy (SR)- Reporting System



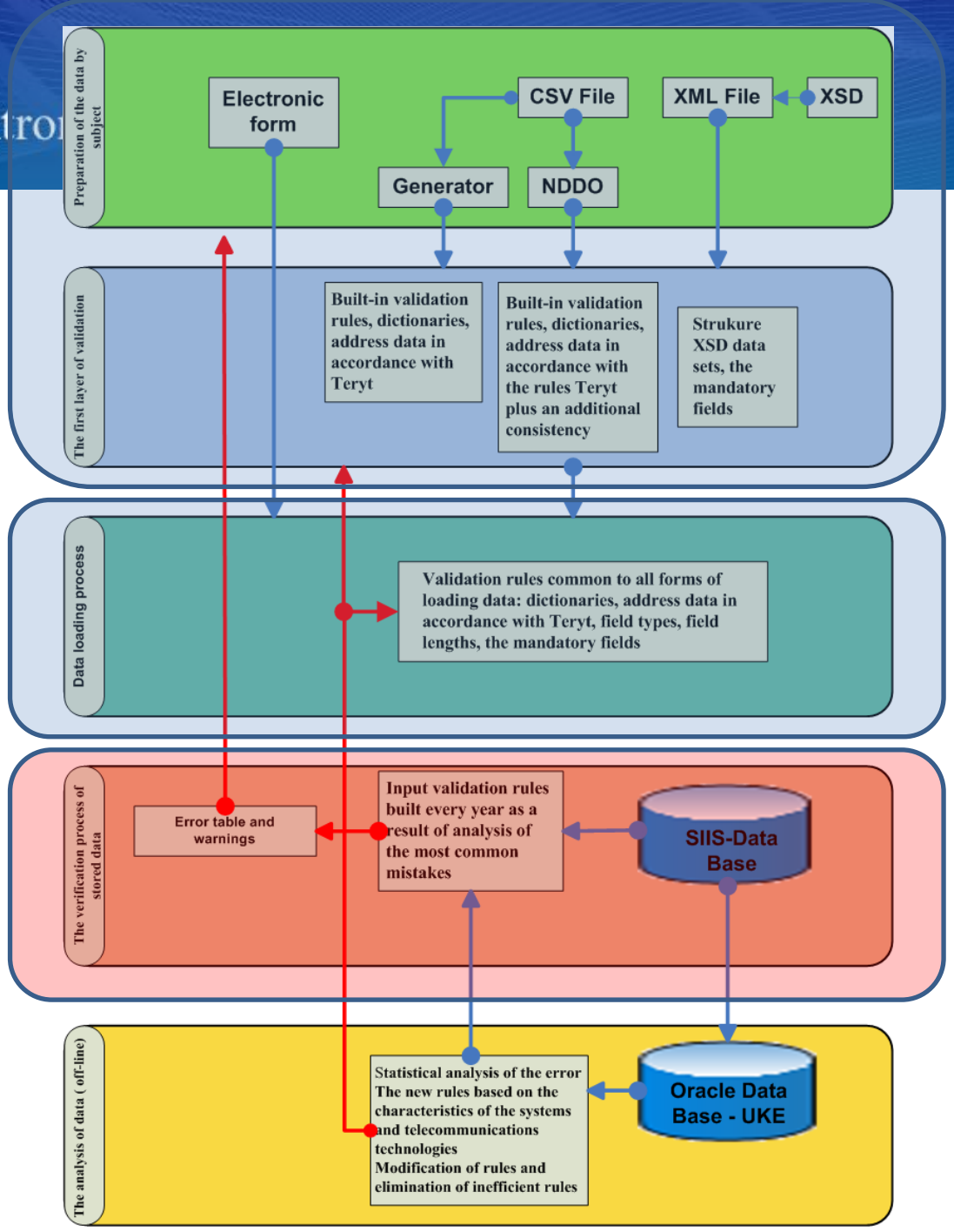






Aggregated and geo-referenced inventory data displayed in GIS app. and portal **Polska Szerokopasmowa**

Adaptive-three level process of data verification



New level
23 accuracy rules

Some examples of accuracy rules

- **Rule 1: Full accuracy of data**
- Description: Checking data in the SIIS for compliance with the principles of SIIS v3 (related mainly to data imported from SIIS v2, that was not updated by the entity).
- **Rule 2: Coordinates outside Poland**
- Description: The declared coordinates of the object are outside the smallest rectangle containing Poland. Parameters: Coordinates of the object have a geographical latitude outside the range from 49°00' to 54°50', or longitude outside the range from 14°07' and 24°09'.
- **Rule 5: Potential of the third party**
- Description: Zero coverage is given for using infrastructure of the third party (BSA, WLR). Parameters of the rule: Each record with zero number of clients and *infrastructure_owner* field belonging to a defined set. The initial set is determined as: ('WLR%','BSA%').
- **Rule 15: Addresses of many buildings**
- Description: Under one record of the range there is data for many buildings. Parameters of the rule: House number matches one of the given patterns. Suspicious patterns: house number contains commas, a dash, or more than three numbers.
- **Rule 16: Address of an apartment building**
- Description: Address of the building is given together with the address of the apartment. Parameters of the rule: An address field contains a subsequence of a defined set. The initial set: ('LOK.','M.').

Some examples of accuracy rules -1

- **Rule 17: Text in the number of the building**
- Description: The building number contains long sequences of letters. Parameters of the rule: In the building number there are sequences of letters longer than M. Proposed M = 2.
- **Rule 18: Many inaccurate addresses**
- Description: A large part of the address records is not in the address reference database. Parameters of the rule: The percentage of non-covered addresses of the operator exceeds M% for operators higher than N records or above O addresses. Proposed M=40, N=100, O=50.
- **Rule 20: Nodes not linked with co-location**
- Description: The node does not have a declared co-location, but its address is the same as the address of a certain co-location of the same operator. Parameters of the rule: The identity of node and co-location addresses of a given operator in the absence of specific co-location in the node record.

Some examples of accuracy rules-2

- **Rule 22: Suspicious radius of the sector**
- Description: Incorrect value of the radius in the context of the reported transmission technology. Parameters of the rule: The radius of the sector exceeding:
  - 3 km for the WiFi,
  - 50 km for the WiMAX technology,
  - 15 km for the LTE technology
  - 15 km for LMDS technology.
- **Rule 23: Wrong terminating segment of cable lines**
- Description: Incorrect topology of cable networks. Parameters of the rule: Reported initial segment of the cable line is equal to the terminating segment.

Third Inventory process

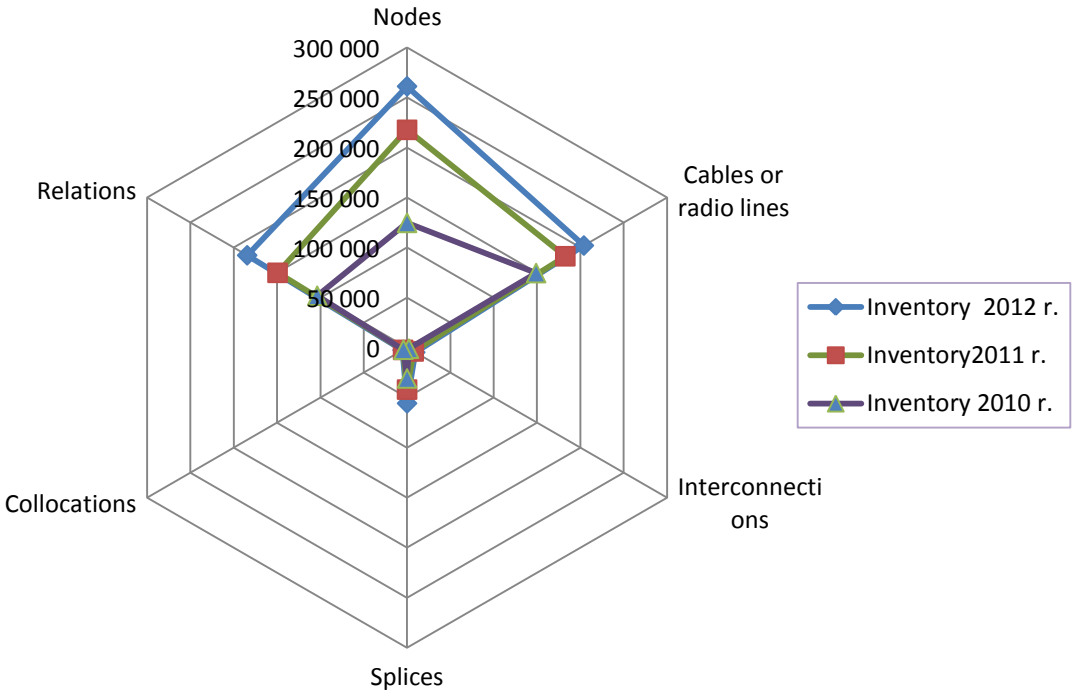
Outcomes compared to all previous processes

Entities requstes to send data

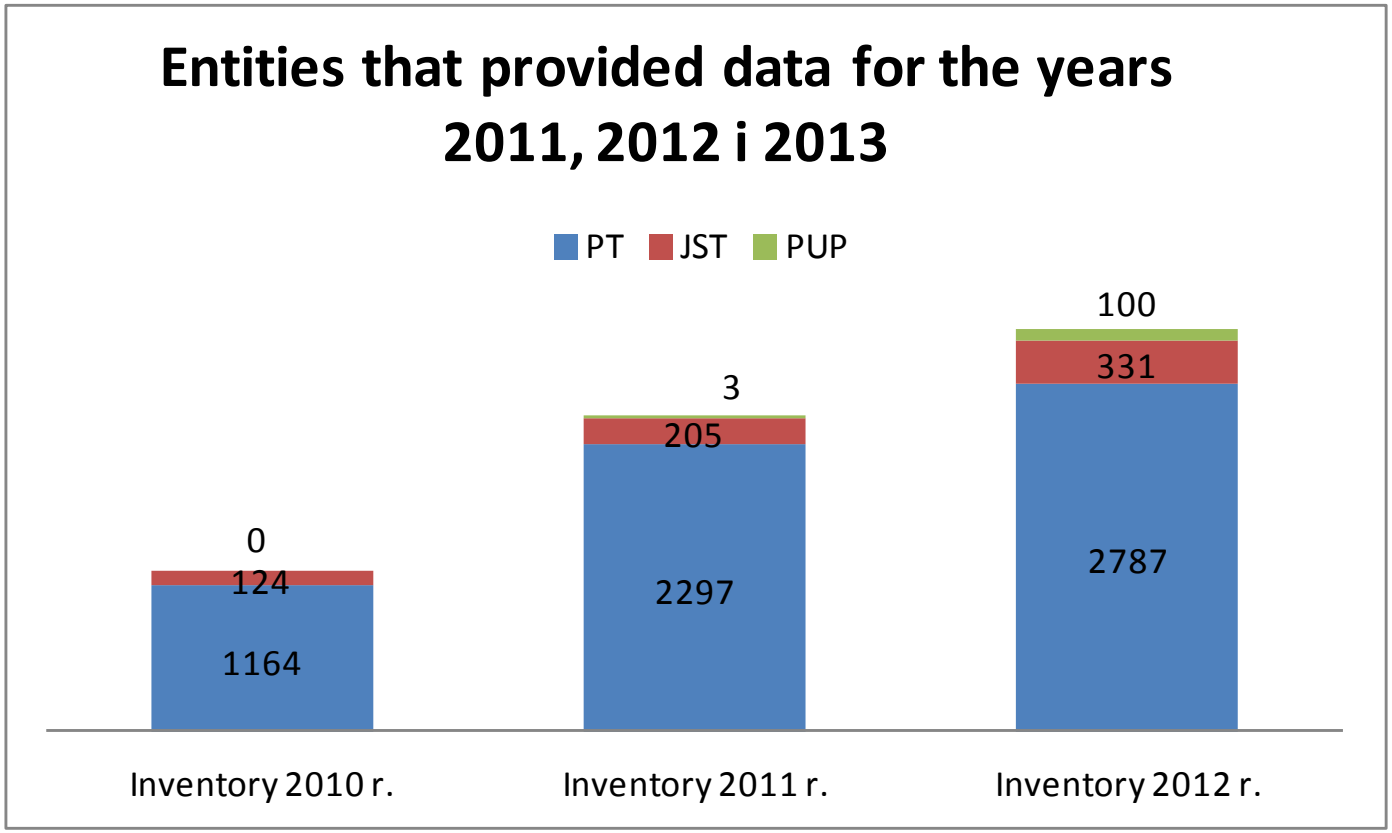
Entity type	No. of requests		
	Inventory 2012 r.	Inventory 2011 r.	Inventory 2010 r.
PT	6547	6506	6987
JST	2812	2485	2506
PUP	872	30	0
Total	10231	9021	9493

Received data

	Inventory 2012 r.	Inventory2011 r.	Inventory 2010 r.
Nodes	261 166	217 698	124687
Cables or radio lines	204 066	182 643	148987
Interconnections	9 429	7 641	2173
Splices	55 694	41 975	30835
Collocations	5 147	4 585	4184
Relations	184 541	149 498	103687

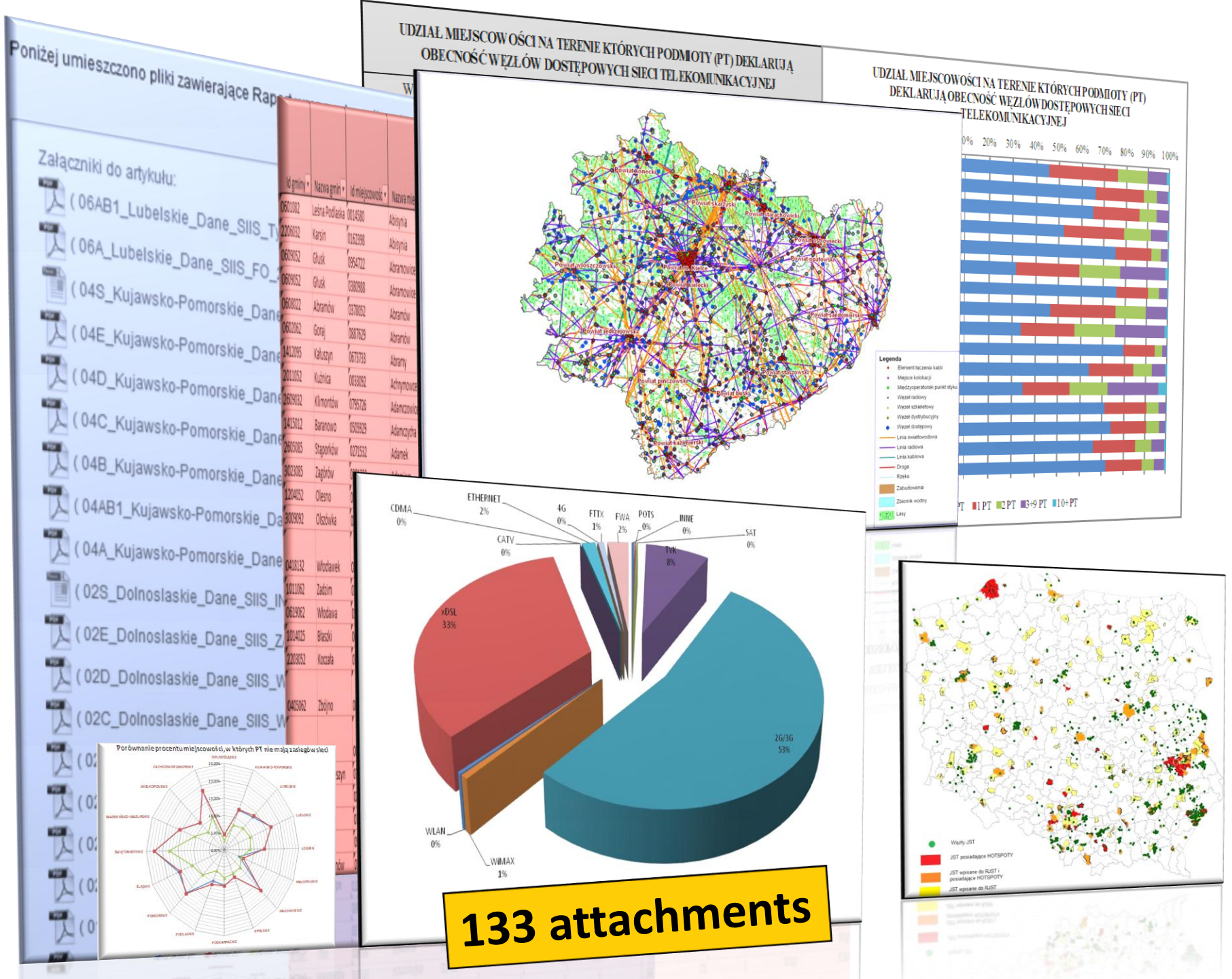


Better collectability of data



Estimation - volume od data represents more than 90 % of market


RAPORT
Report
on the coverage of the Republic of Poland
with the existing telecommunications
infrastructure,
investment projects implemented in 2012 and
planned for 2013, as well as with buildings
enabling collocation.
http://www.uke.gov.pl/inwentaryzacja-2013-12077


Poniżej umieszczono pliki zawierające Rap
Załączniki do artykułu:
(06AB1_Lubelskie_Dane_SIIS_T
(06A_Lubelskie_Dane_SIIS_FO_
(04S_Kujawsko-Pomorskie_Dane
(04E_Kujawsko-Pomorskie_Dane
(04D_Kujawsko-Pomorskie_Dane
(04C_Kujawsko-Pomorskie_Dane
(04B_Kujawsko-Pomorskie_Dane
(04AB1_Kujawsko-Pomorskie_Da
(04A_Kujawsko-Pomorskie_Dane
(02S_Dolnoslaskie_Dane_SIIS_I
(02E_Dolnoslaskie_Dane_SIIS_Z
(02D_Dolnoslaskie_Dane_SIIS_W
(02C_Dolnoslaskie_Dane_SIIS_W
Id gminy
Nazwa gmin
Id miejscowość
Nazwa mie
0600102 Leśna Podlaska 0014580 Abisynia
2206102 Karsin 0152288 Abisynia
0609052 Głusk 0954722 Abramowice
0609052 Głusk 0380688 Abramowice
0600022 Abramów 0378052 Abramów
0602062 Goraj 0887629 Abramów
1412095 Kałuszyn 0677333 Abramy
2011052 Kuźnica 0033892 Achrymowce
2603022 Klimontów 0795726 Adamczowice
1415012 Baranowo 0559529 Adamczycha
2603085 Stąporków 0271532 Adamek
3602085 Zagórów
1204052 Olesno
3003092 Olszówka
0418132 Włodawek
1011062 Zadzim
0613062 Włodawa
1014025 Błeszki
2203052 Koczała
0405062 Zbójno
Porównanie procentu miejscowości, w których PT nie mają zasięgu w sieci
DOLNOŚLĄSKIE
KUJAWSKO-POMORSKIE
LUBELSKIE
LUBUSKIE
MAŁOPOLSKIE
MAZOWIECKIE
OPOLSKIE
PODKARPACKIE
PODLASKIE
POMORSKIE
ŚLĄSKIE
ŚWIĘTOKRZYSKIE
WARMIŃSKO-MAZURSKIE
WIELKOPOLSKIE
ZACHODNIOPOMORSKIE
UDZIAŁ MIEJSCOWOŚCI NA TERENIE KTÓRYCH PODMIOTY (PT) DEKLARUJĄ OBECNOŚĆ WĘZŁÓW DOSTĘPOWYCH SIECI TELEKOMUNIKACYJNEJ
Powiat sokolski
Powiat skarżyski
Powiat starachowicki
Powiat ostrowiecki
Powiat opatowski
Powiat wieruszowski
Powiat Kielce
Powiat kielecki
Powiat sandomierski
Powiat jędrzejowski
Powiat stszowski
Powiat pińczowski
Powiat buski
Powiat kazimierski
Legenda
Element łączenia kabli
Miejsce kolokacji
Międzyoperatorski punkt styku
Węzeł radiowy
Węzeł szkieletowy
Węzeł dystrybucyjny
Węzeł dostępowy
Linia światłowodowa
Linia radiowa
Linia kablowa
Droga
Rzeka
Zabudowania
Zbiornik wodny
Lasy
UDZIAŁ MIEJSCOWOŚCI NA TERENIE KTÓRYCH PODMIOTY (PT) DEKLARUJĄ OBECNOŚĆ WĘZŁÓW DOSTĘPOWYCH SIECI TELEKOMUNIKACYJNEJ
0% 20% 30% 40% 50% 60% 70% 80% 90% 100%
PT 1 PT 2 PT 3÷9 PT 10+ PT
CDMA 0%
ETHERNET 2%
4G 0%
FTTX 1%
FWA 2%
POTS 0%
INNE 0%
SAT 0%
CATV 0%
TVK 8%
xDSL 33%
2G/3G 53%
WLAN 0%
WiMAX 1%
Wejścia JST
JST posiadające HOTSPOTY
JST wpisane do RIJT i posiadające HOTSPOTY
JST wpisane do RIJT
133 attachments

Report content

- The Report presents in detail a current condition of the infrastructure, investment projects implemented in 2011, as well as investment projects planned for 2012 within the following areas:
- fibre optic network terminations,
- telecommunications network nodes,
- access nodes,
- coverage of cable and wireless networks,
- penetration of cable connections or wireless terminals in buildings,
- occurrence of cable connections or wireless terminals in residential buildings,
- existence of buildings enabling collocation.

Detailed information is presented in the form of tables, charts and maps at the Polish province level (some information is presented at the commune level).

Data usage

The data were used for the purposes of:

- For telecommunications operators, as well as for other entities possessing/investing in telecommunications infrastructure, the report should be a source of detailed information allowing to make business decisions on new investment projects or modification of the existing infrastructure as well as on the market competitiveness,
- for other investors, the report may be a source of information concerning the attractiveness of a given investment location from the point of view of accessibility to telecommunications technologies,
- for local self-government and other local government units, the report may be not only a basis for making decisions on investment projects financed with public means, but also a flagship of their activity and prospective plans related to the region attractiveness,

Data usage 2

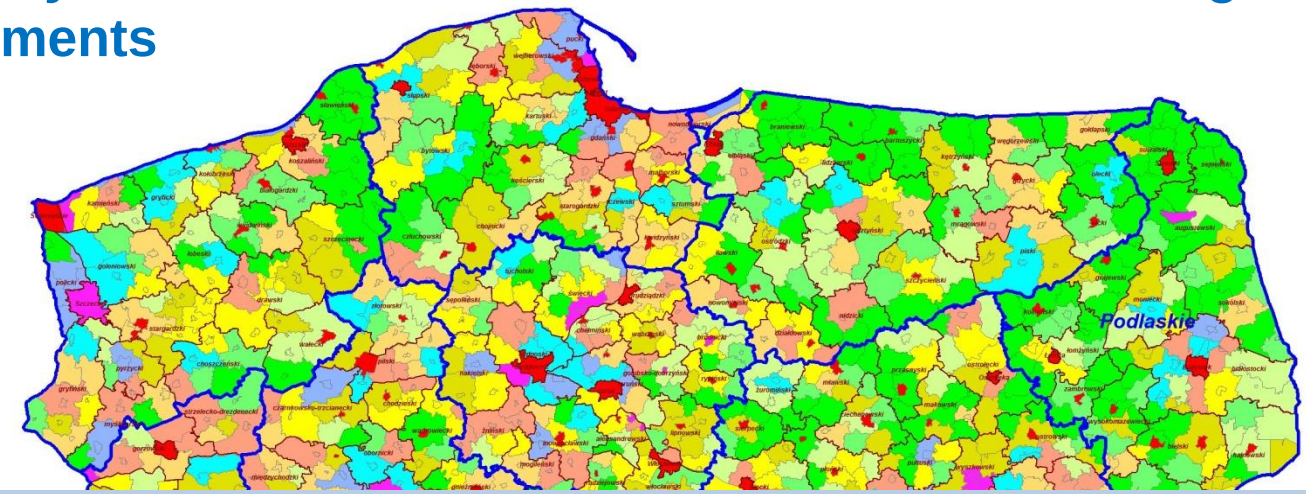
The data were used for the purposes of :

- Regional Operational Programs and the "Eastern Poland" Operational Program during notifications to the EU of plans for the roll-out of regional broadband networks.
- Measure 8.4 (last mile) as regards the allocation of financial resources to small and medium sized undertakings for the roll-out of the last mile
- issuing opinions with regard to public resources expenditure on the roll-out of telecommunications networks by local self-government authorities.
- For consumers, the report may be a tool enabling selection of the most attractive telecommunications technologies, as well as a source of information allowing for selection of the most competitive market offer.

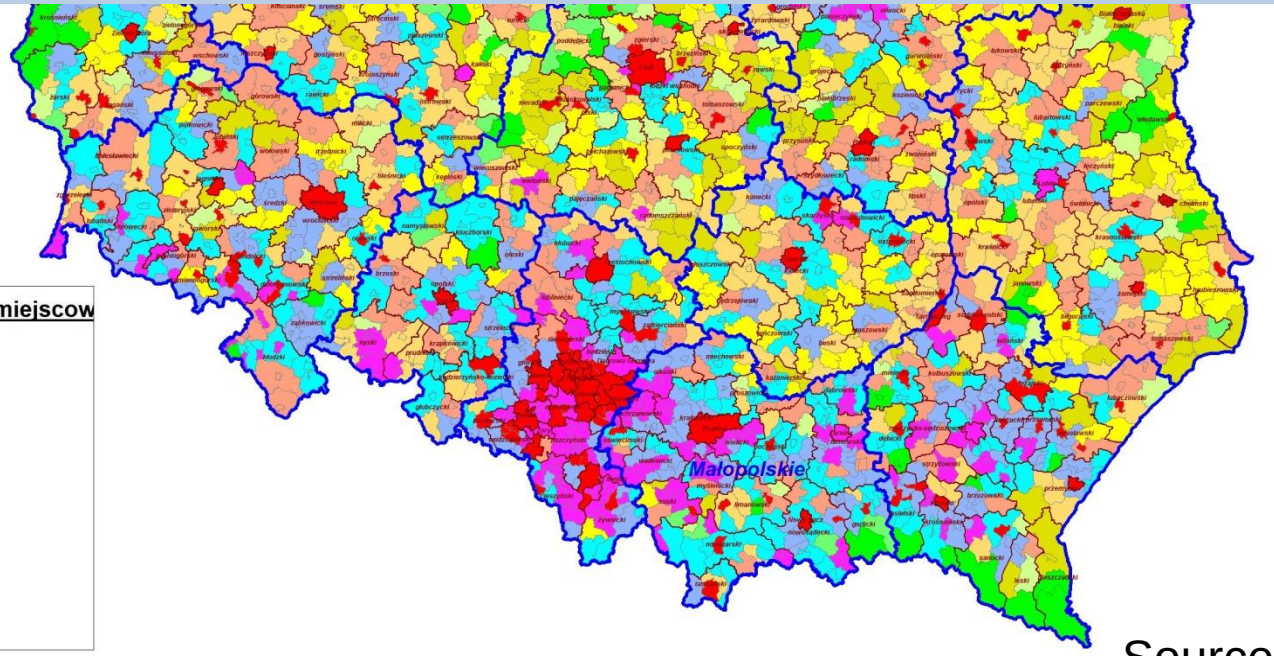
Inventory is now a regular part of the development of broadband infrastructure in Poland

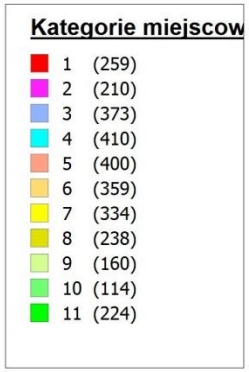
- It is part of the strategy of the President of UKE
- It is a tool in new financial perspective 2014-2020 to localize public intervention
- Inventory results and indicators are basic to National Broadband Plan
- It supports the development of analytical studies on broadband internet in Poland

Gap analyses – level of needed investment to full fill Digital Agenda requirements



The base data are data from infrastructure inventory





Source Infostrategia

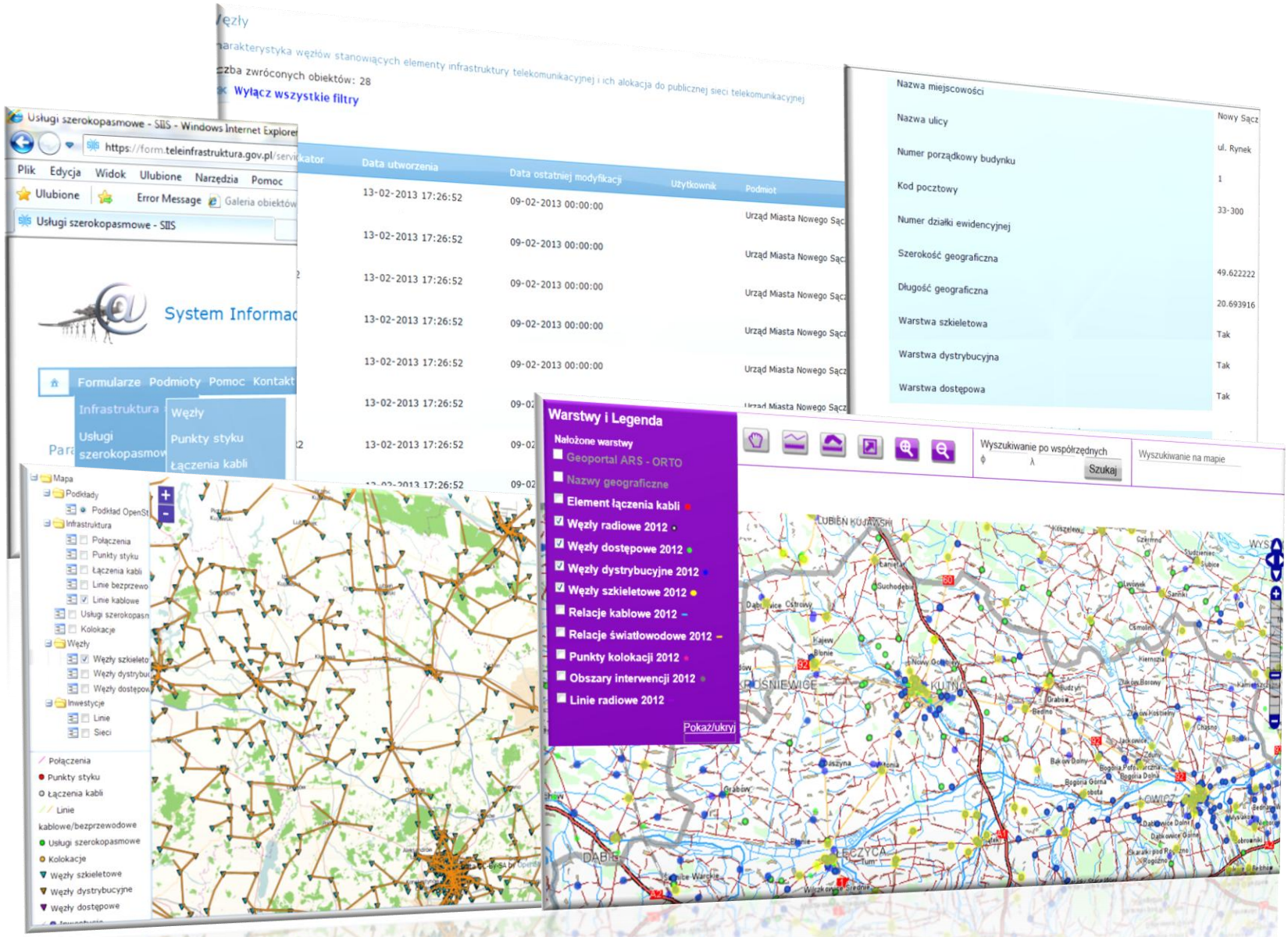
Data presentation

SIIS geoportal

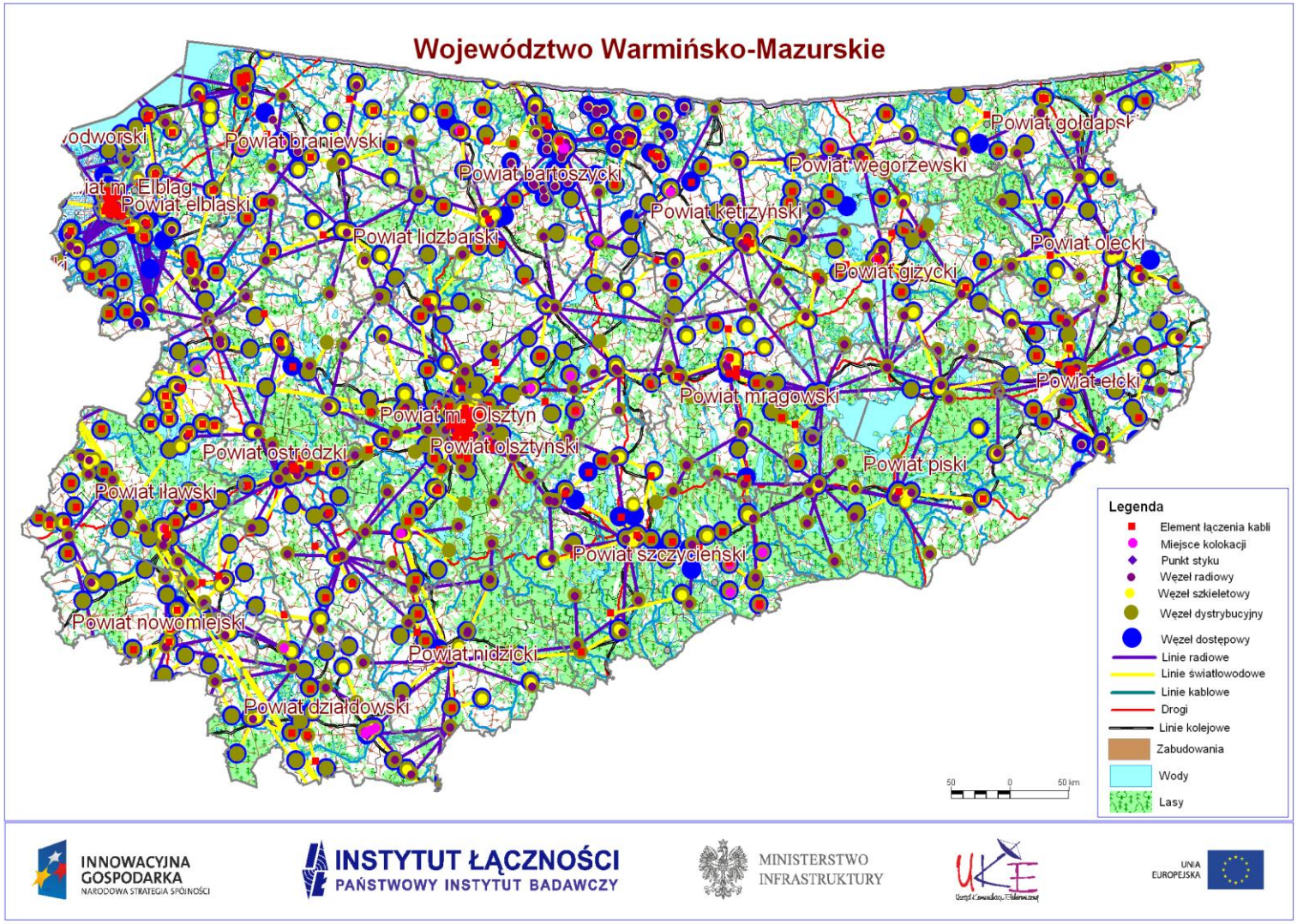
Rzeczpospolita Polska

Urząd Komunikacji Elektronicznej

All data becomes from SIIS, panel for data gathering and portal for public access



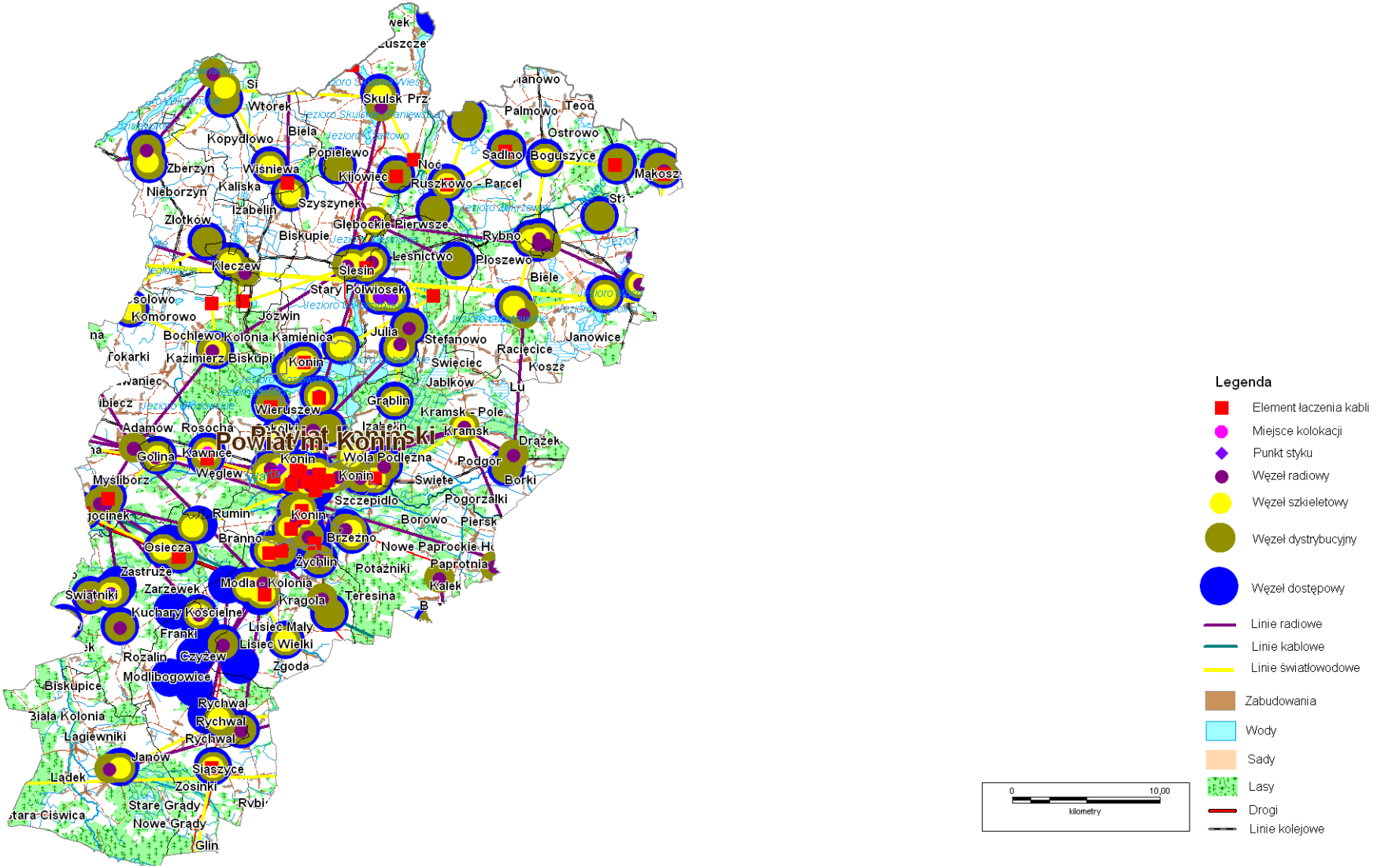
Voivodship level



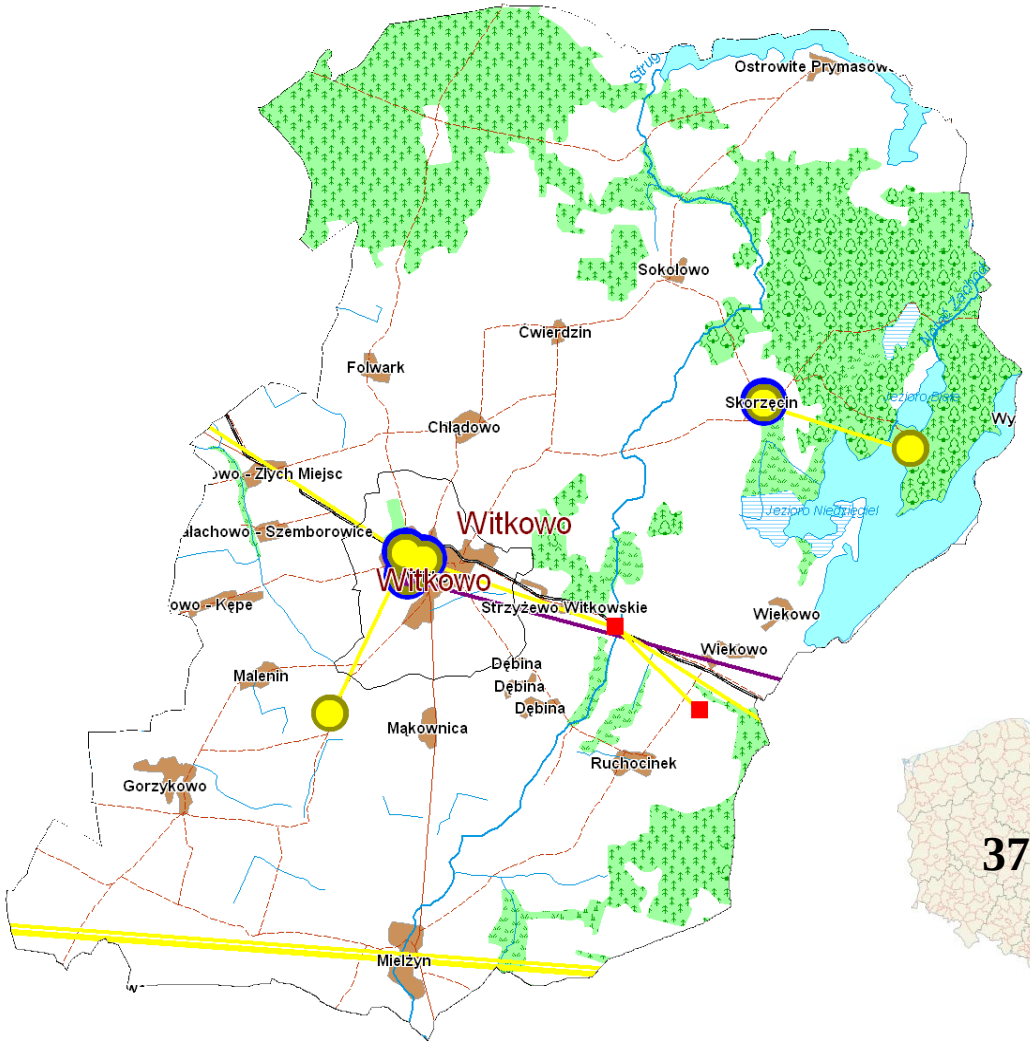
INNOWACYJNA GOSPODARKA NARODOWA STRATEGIA SPÓJNOŚCI
INSTYTUT ŁĄCZNOŚCI PAŃSTWOWY INSTYTUT BADAWCZY
MINISTERSTWO INFRASTRUKTURY
UKE
UNIA EUROPEJSKA

Data wydruku:2011-10-31

District level -Infrastructure around the medium city



District level-Small city and rural area



Legenda
- Element łaczenia kabli
- Miejsce kolokacji
- Punkt styku
- Węzeł radiowy
- Węzeł szkieletowy
- Węzeł dystrybucyjny
- Węzeł dostępowy
- Linie radiowe
- Linie kablowe
- Linie światłowodowe
- Zabudowania
- Wody
- Sady
- Lasy
- Drogi
- Linie kolejowe

Mapy infrastruktury

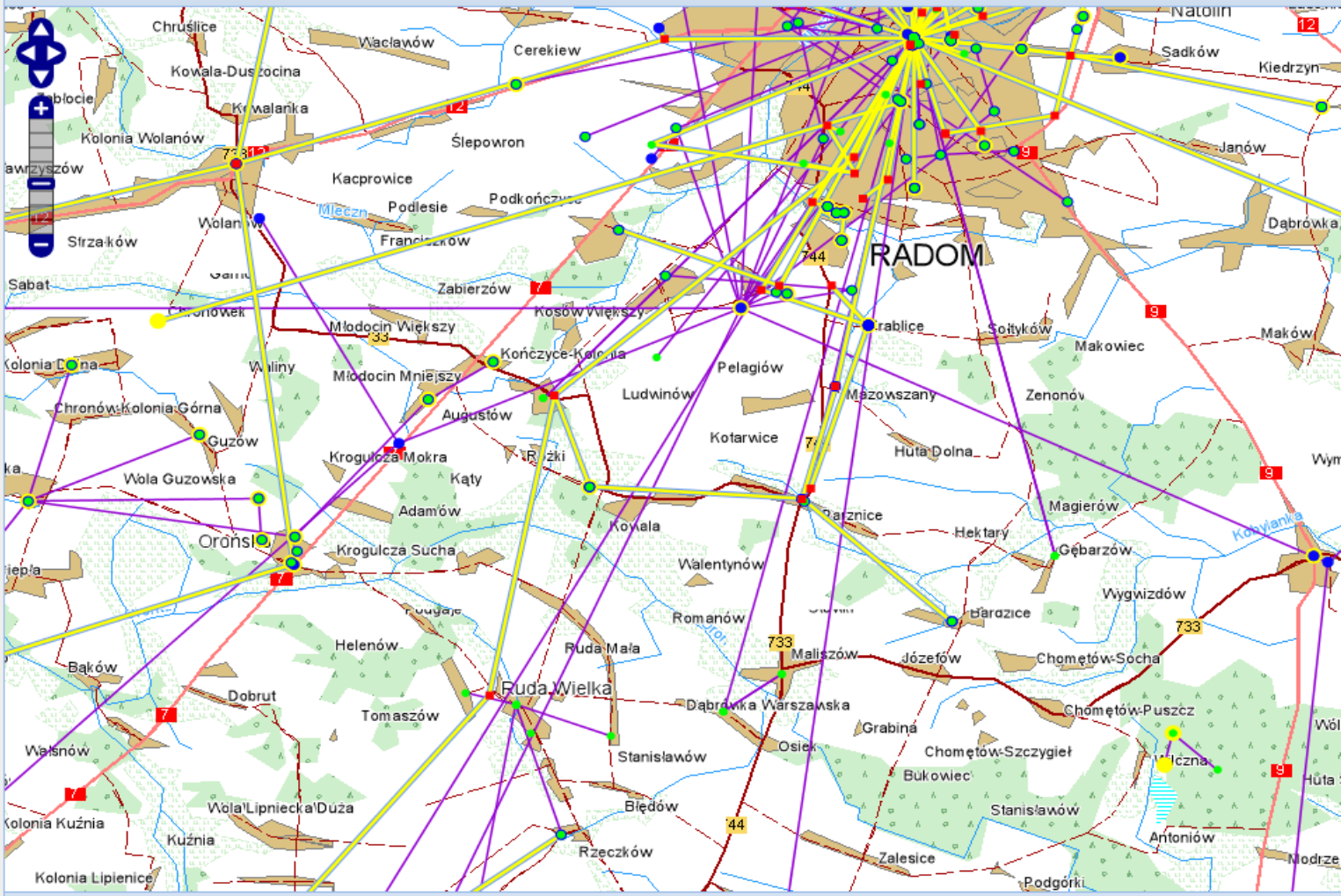
- Warstwy
  - Punkty styku
  - Elementy łączenia kabli
    - Elementy łączenia kabli
    - Elementy łączenia kabli - Etyki
  - Węzły szkieletowe
    - Węzły szkieletowe
    - Węzły szkieletowe - Etykiety
  - Węzły dystrybucyjne
    - Węzły dystrybucyjne
    - Węzły dystrybucyjne - Etykiet
  - Węzły dostępowe
    - Węzły dostępowe
    - Węzły dostępowe - Etykiety
  - Węzły radiowe
  - Linie
    - Linie światłowodowe do udo
    - Linie światłowodowe
    - Linie radiowe
    - Linie kablowe

Mapy podkładowe/tematyczne

- Warstwy
  - BDO
  - TOPO
  - ORTO
  - Podział administracyjny
  - Operatorzy w gminach
  - Infrastruktura w gminach

Mapa

Wyśrodkuj | Kasuj pomiar | Odległość | Powierzchnia | Legenda | Pomoc

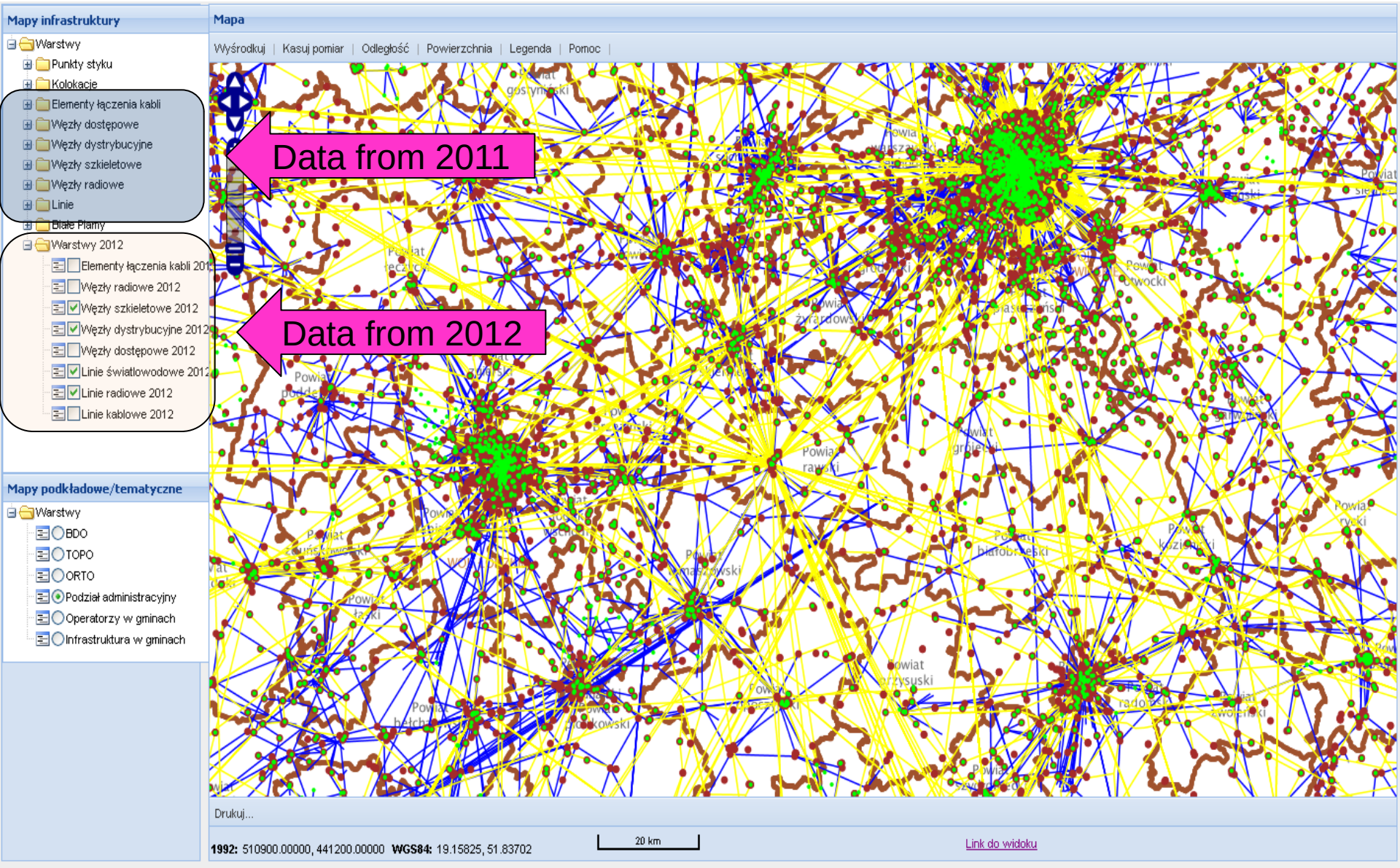


1992: 647025.00000, 388000.00000 **WGS84:** 21.11146, 51.33960

Rzeczpospolita Polska

Urząd Komunikacji Elektronicznej

Infrastructure 2011 and2012

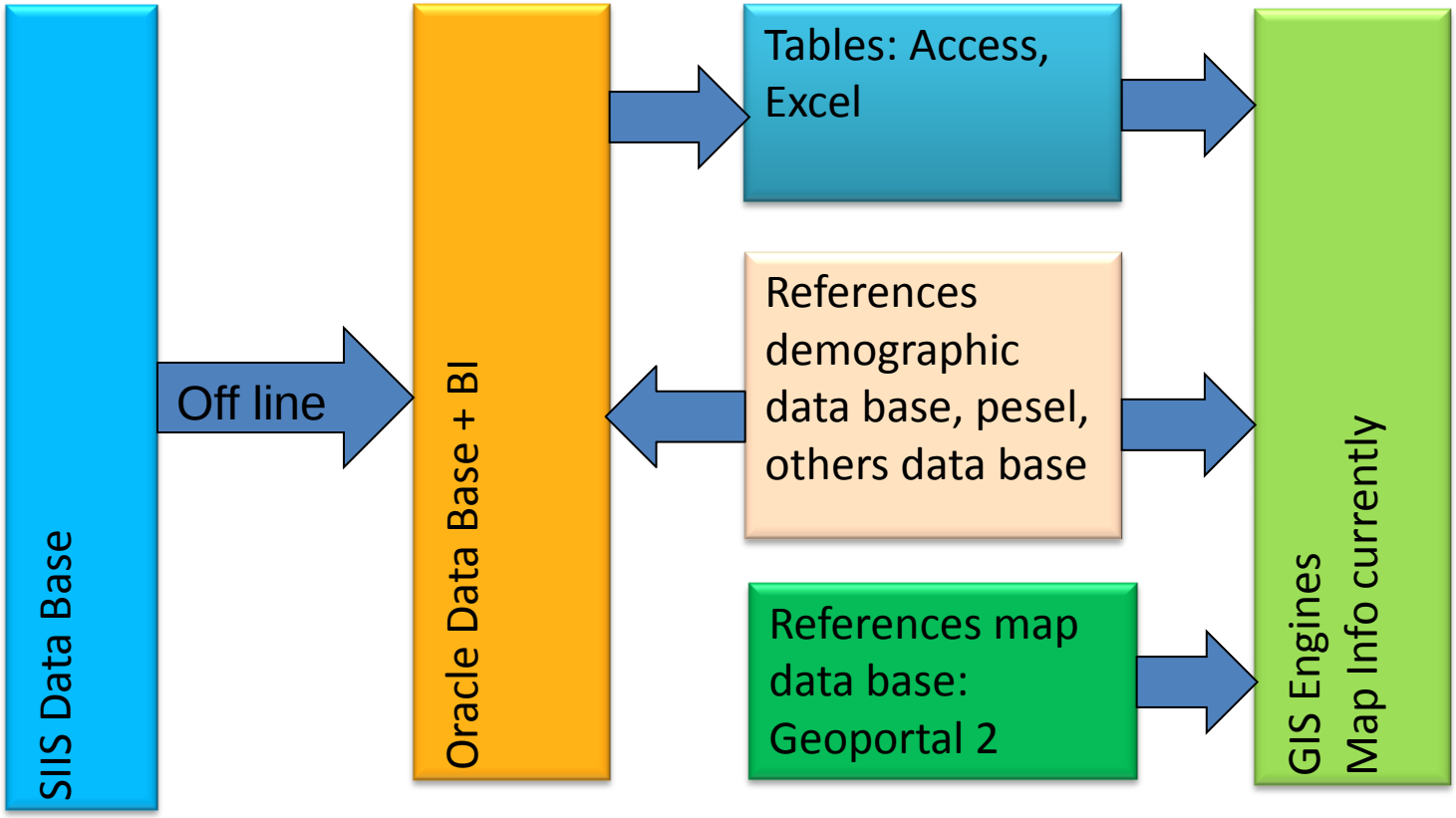


Report system in UKE

Tabular reports

GIS reports

IT environment



Analyses, reports, indexes, penetration, thematic maps.

Indexes

Index for market concentration HHI

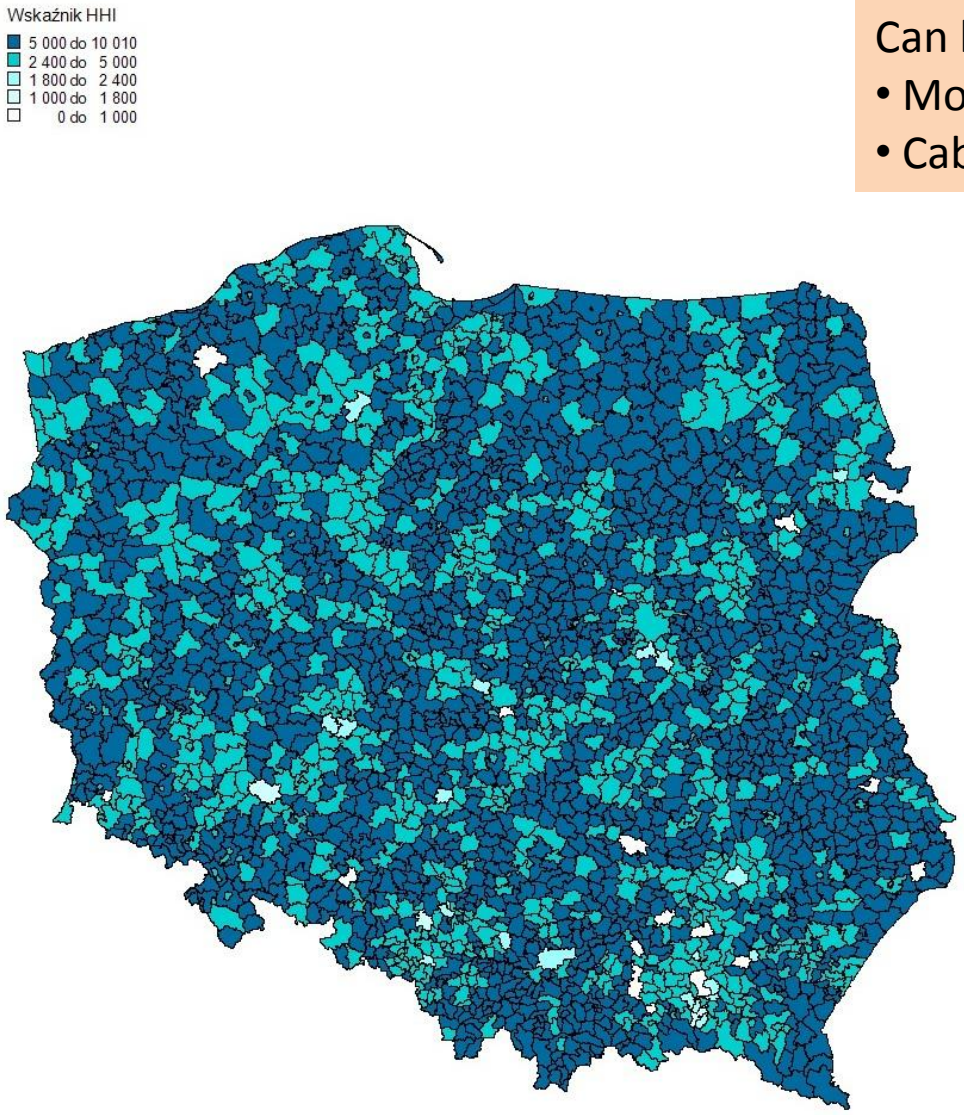
Definition of 'Herfindahl-Hirschman Index - HHI'

A commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. The HHI number can range from close to zero to 10,000. The HHI is expressed as:

HHI = s1^2 + s2^2 + s3^2 + ... + sn^2 (where sn is the market share of the firm, n is the number of firms).

The closer a market is to being a monopoly, the higher the market's concentration (and the lower its competition). If, for example, there were only one firm in an industry, that firm would have 100% market share, and the HHI would equal 10,000 (100^2), indicating a monopoly. Or, if there were thousands of firms competing, each would have nearly 0% market share, and the HHI would be close to zero, indicating nearly perfect competition.

HHI example



Can be calculated for different technologies:

- Mobile
- Cable network

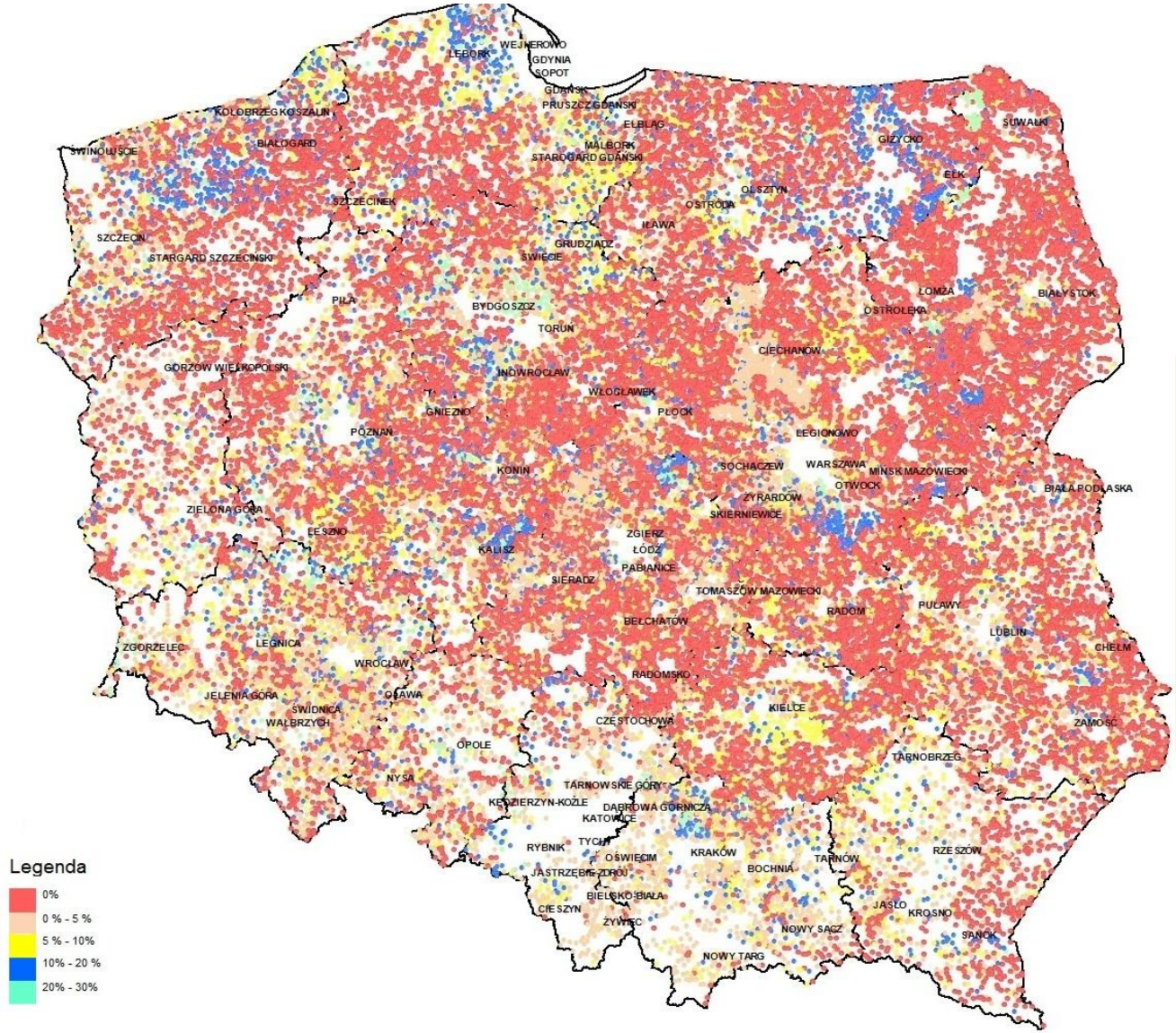
5000 -10 000 lack of monopole

WDUS

- BAI (Broadband Achievement Index) and polish equivalent WDUS consist of:
  - Broadband Infrastructure Availability Index - BIAI
  - Broadband Service Penetration Index - BSPI
  - Broadband Infrastructure Competition Index - BICI
  - Broadband Digital Inclusion Index - BDII
- We can calculate Index for chosen area.
  - In Poland we start aggregation from building level
  - In USA it’s census block

Density index and usage

Density of broadband Internet services against definition of White , Gray and Black areas



Old definition of WGB :

- White - lack of operators
- Grey - one operator
- Black - min. two operators

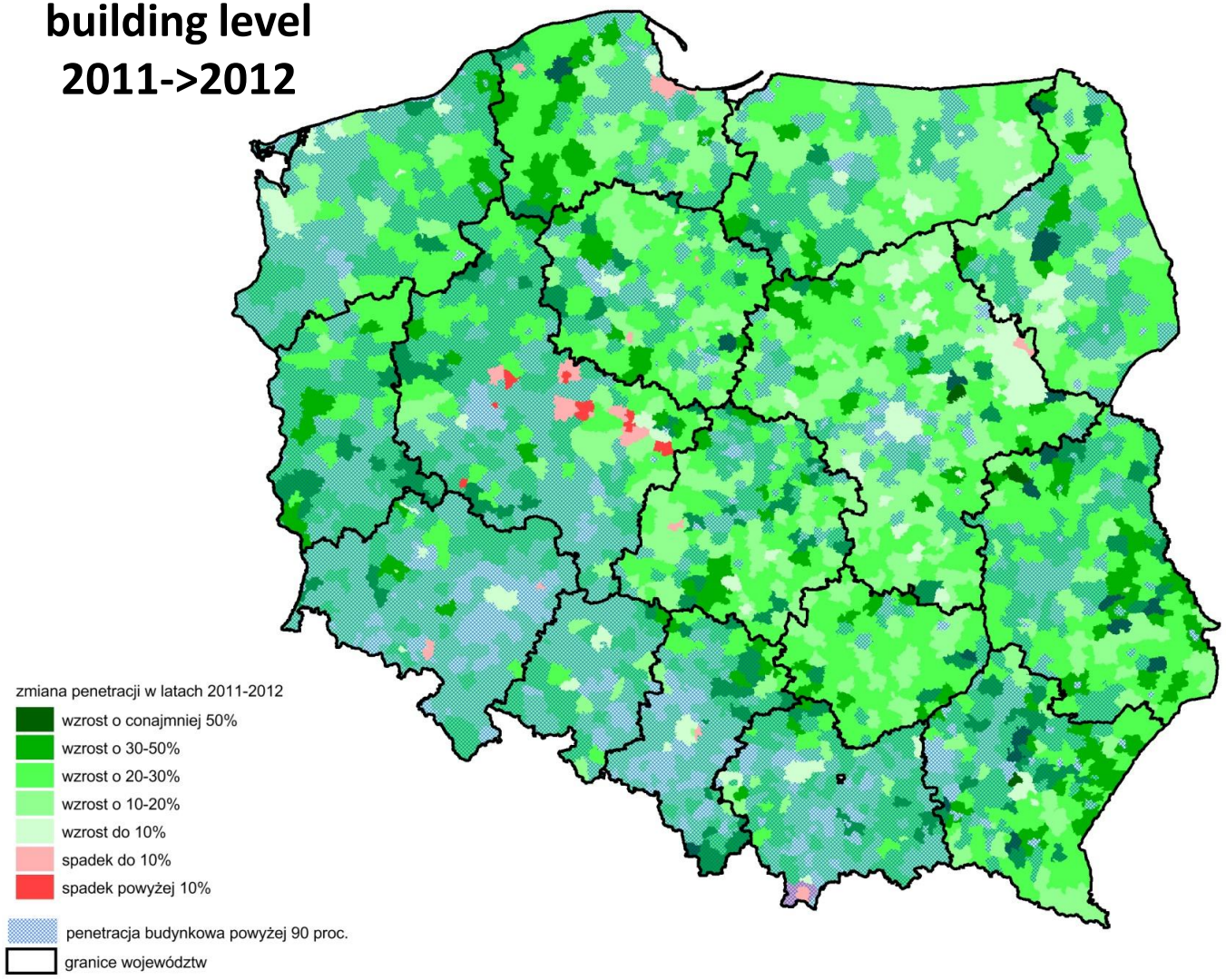
New definition:

Number of Broadband Internet Services on building level aggregated into city divided by number of households.

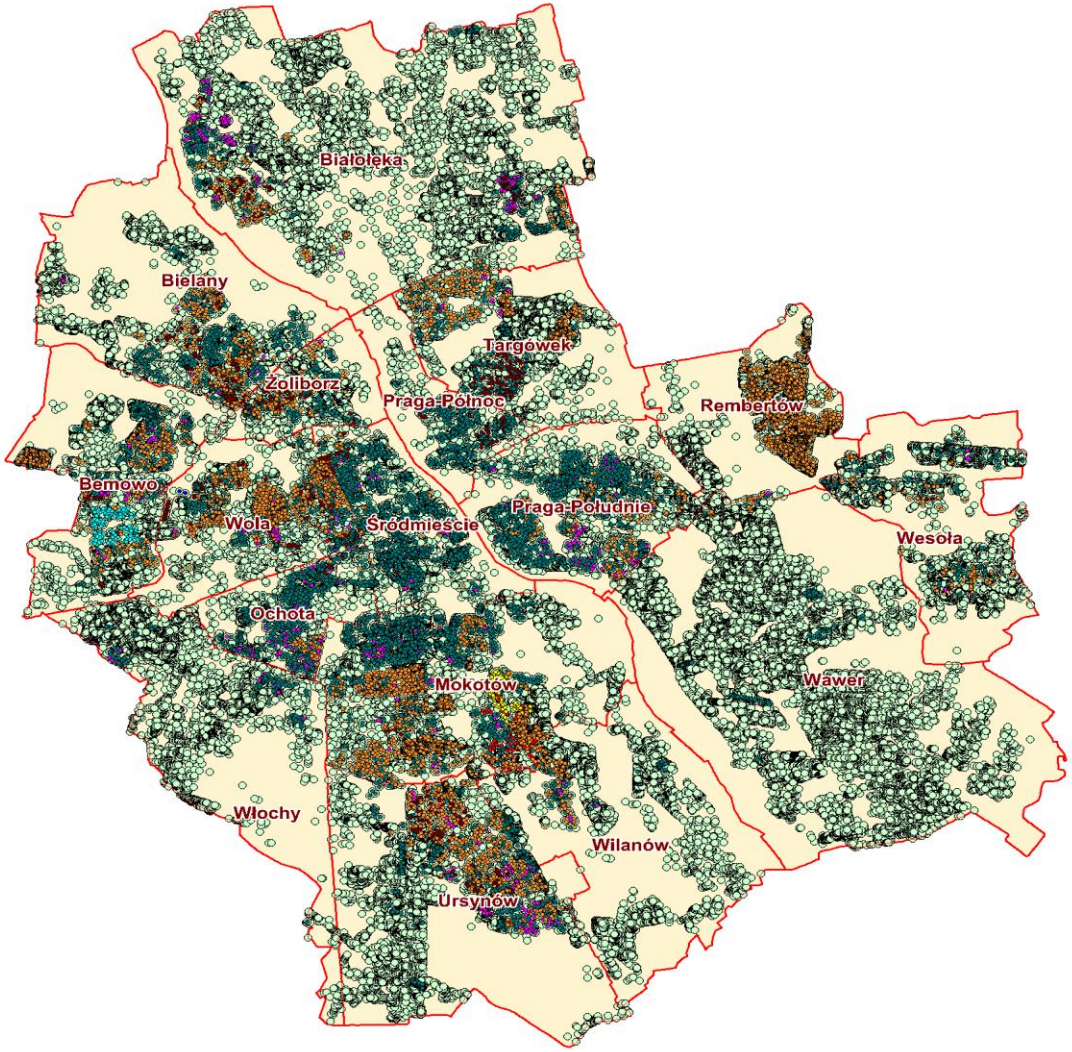
No more than 30% is adaptable level .

Definition of Internet service: No less than 2Mbps

Penetration change of access network on building level 2011->2012



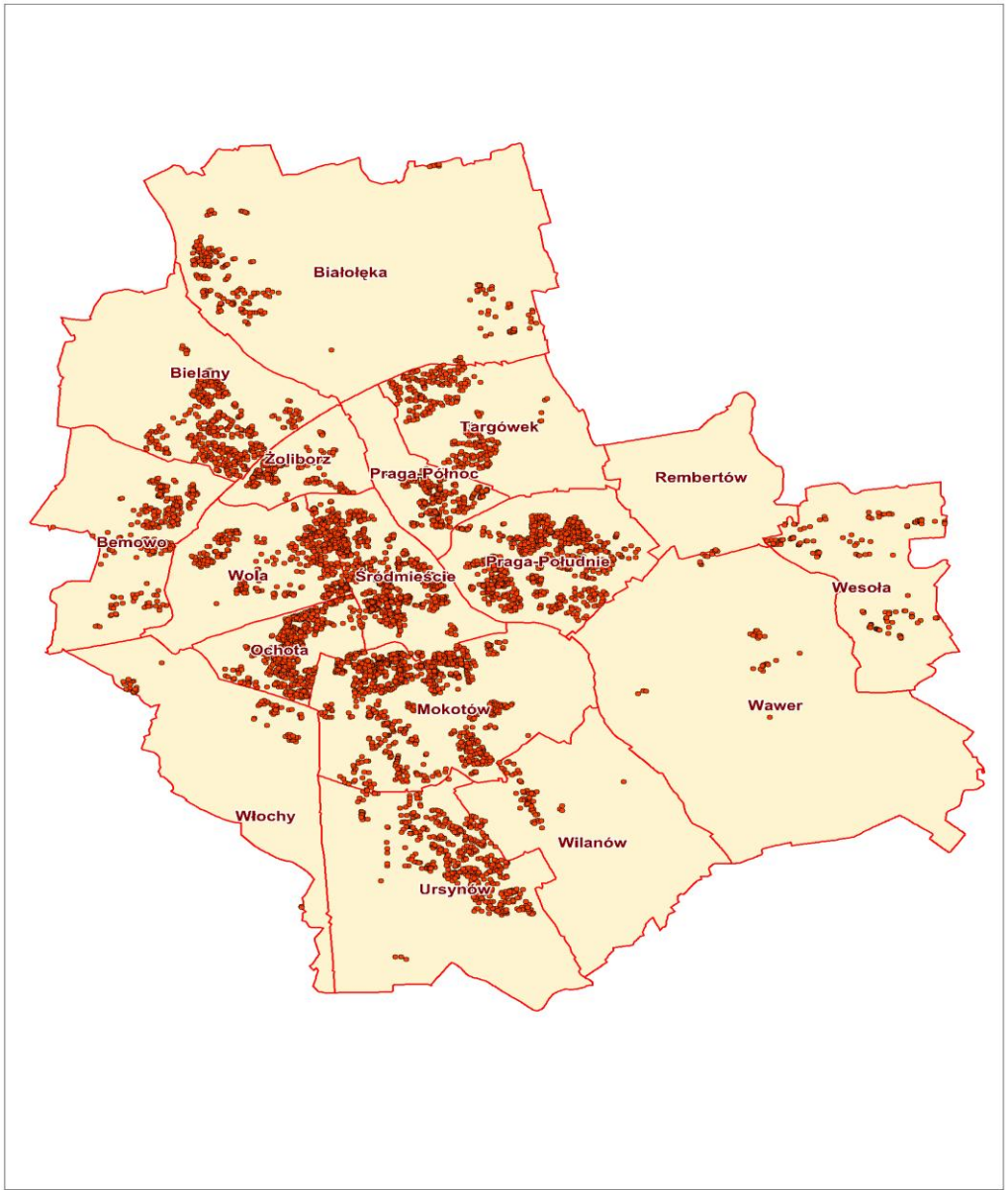
Cable TV penetration in Warsaw



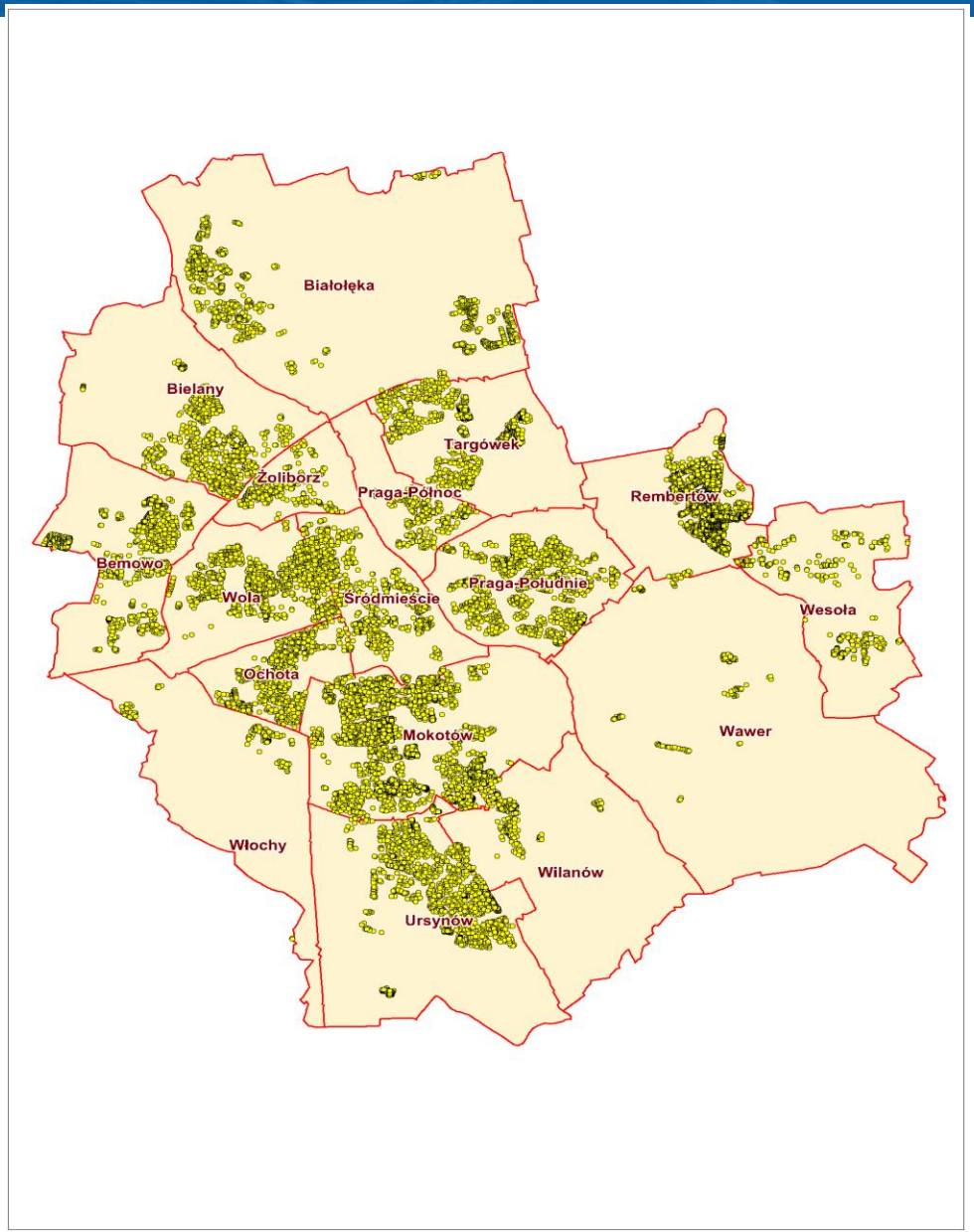
Telekom operator

- PT 1
- PT 2
- PT 3
- PT 4
- PT 5
- PT 6
- PT 7
- PT 8
- PT 9

Not supplied addresses


Białołęka
Bielany
Targówek
Żoliborz
Praga-Północ
Rembertów
Bemowo
Praga-Południe
Wola
Śródmieście
Wesoła
Ochota
Wawer
Mokotów
Włochy
Wilanów
Ursynów

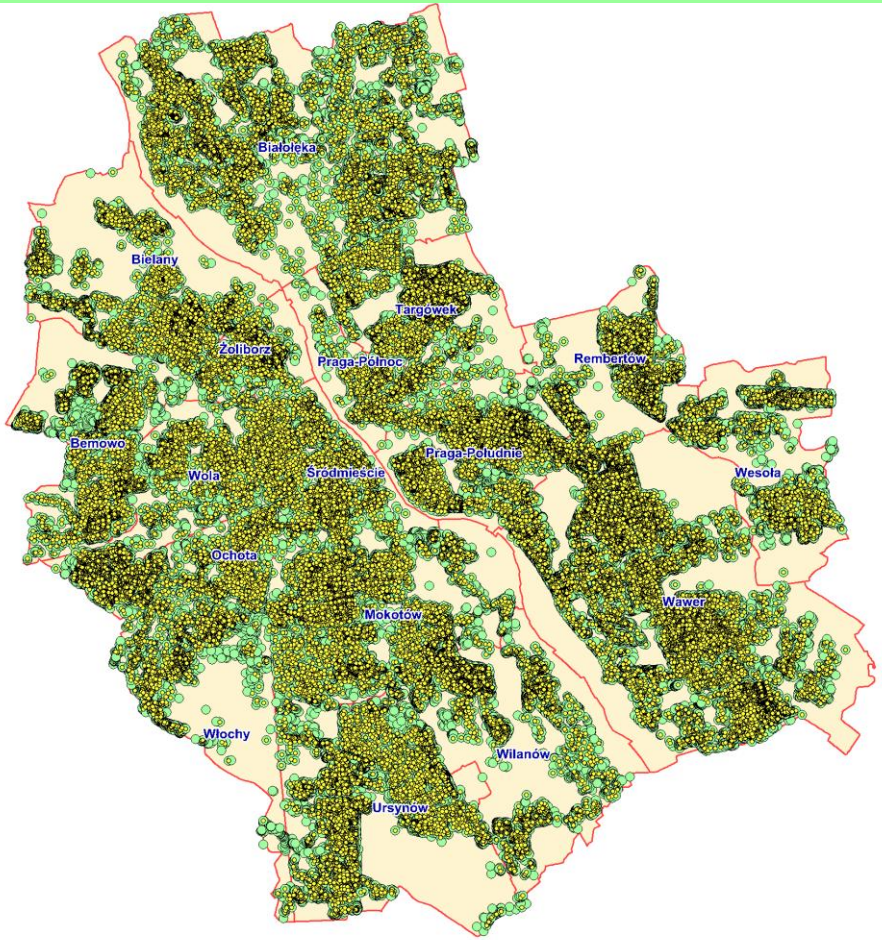
TV+TEL


Białołęka
Bielany
Targówek
Żoliborz
Praga-Północ
Rembertów
Bemowo
Wola
Śródmieście
Praga-Południe
Wesoła
Ochota
Mokotów
Wawer
Włochy
Wilanów
Ursynów

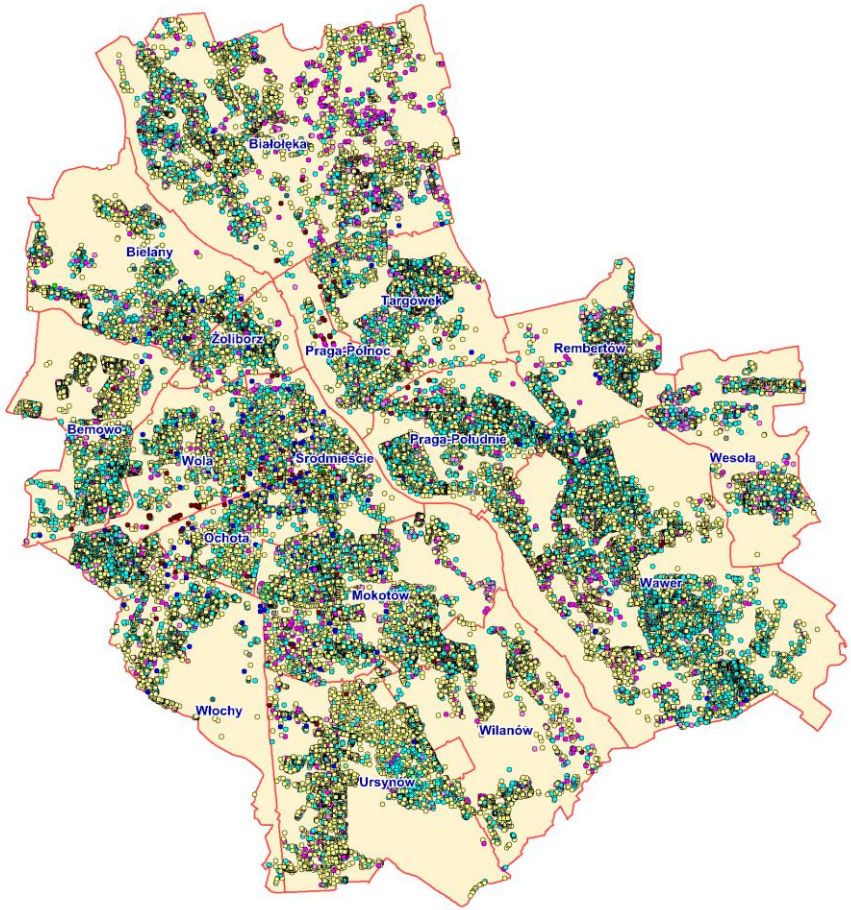
TV+TEL+INT

Infrastructure building penetration

Infrastructure building penetration of cable network without CATV

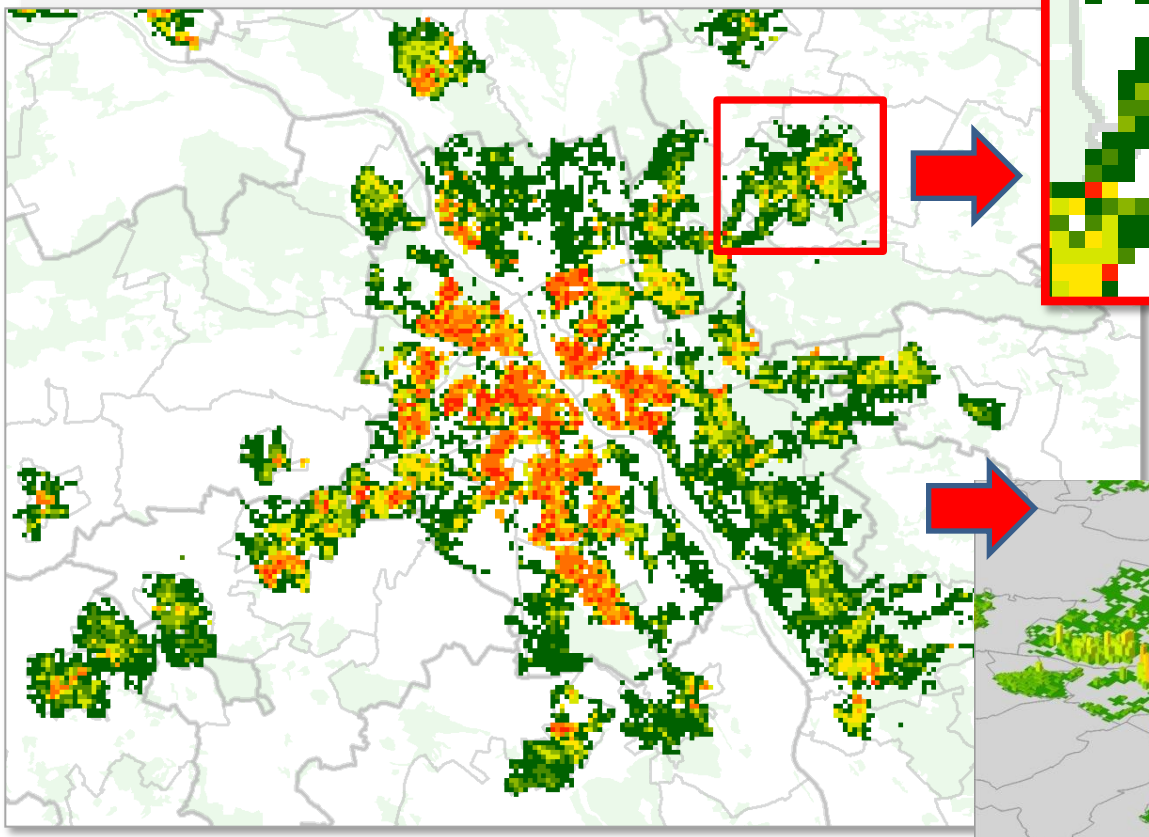


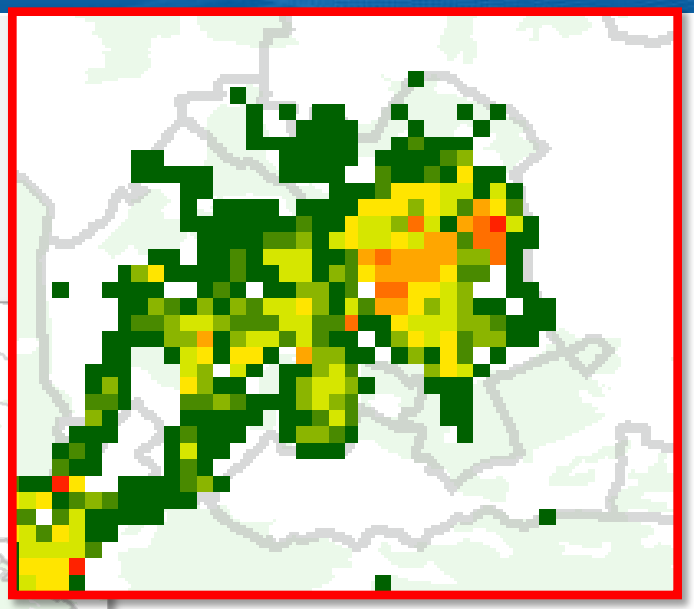
Infrastructure building penetration of cable network without CATV break down on telco operators

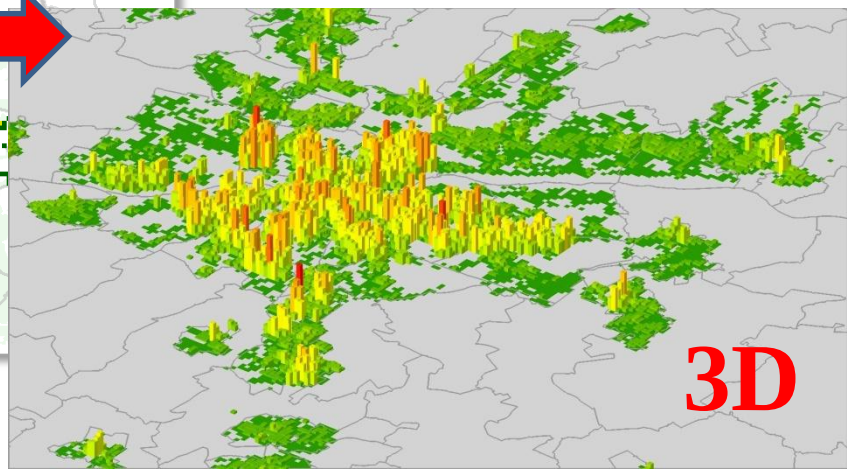


Grid analyses

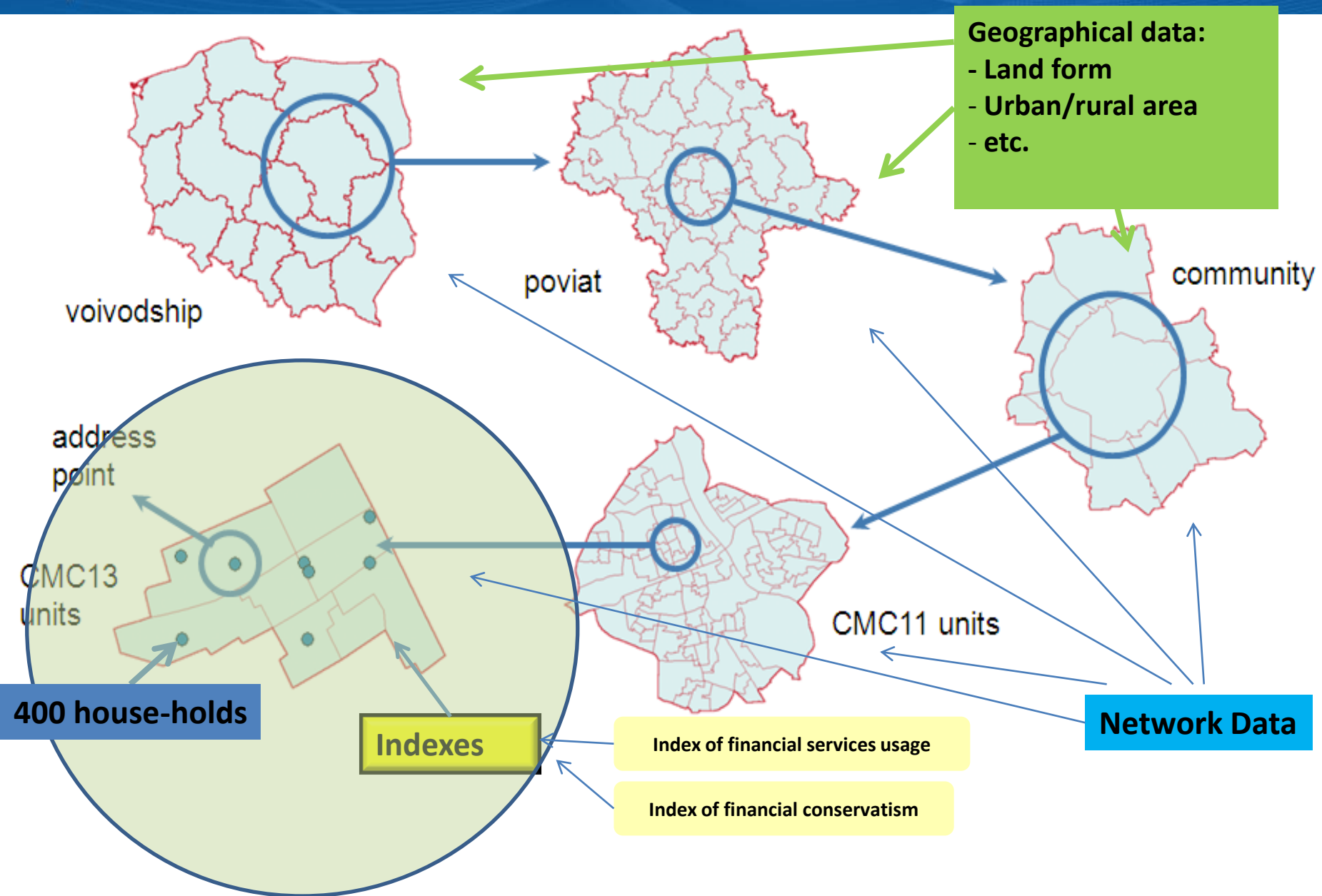
Grid analyses (250*250, CMC13, census area , post code ....)
Each cell can represents .:
-number of buildings
- density
- Internet speed
- No. of Internet suppliers

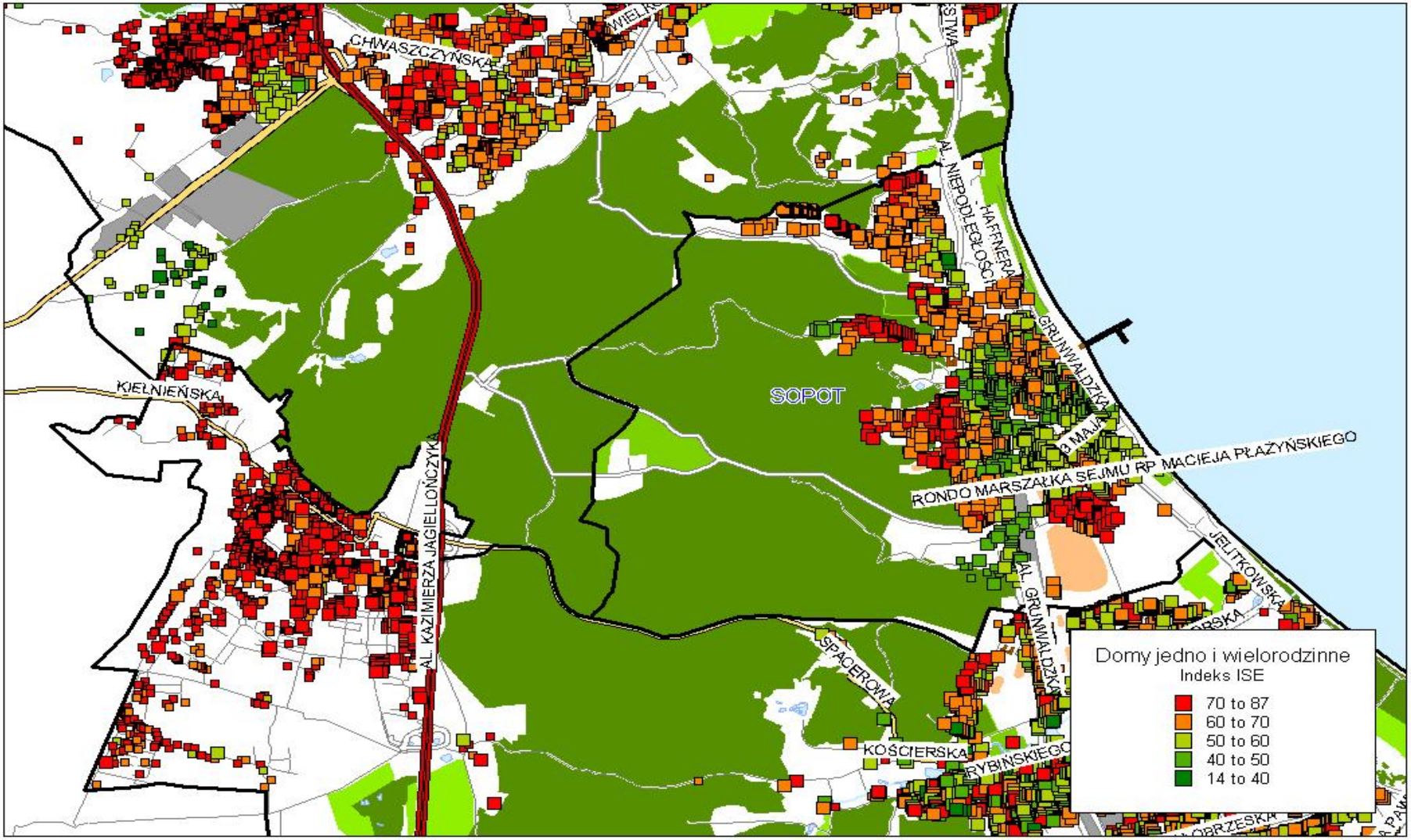




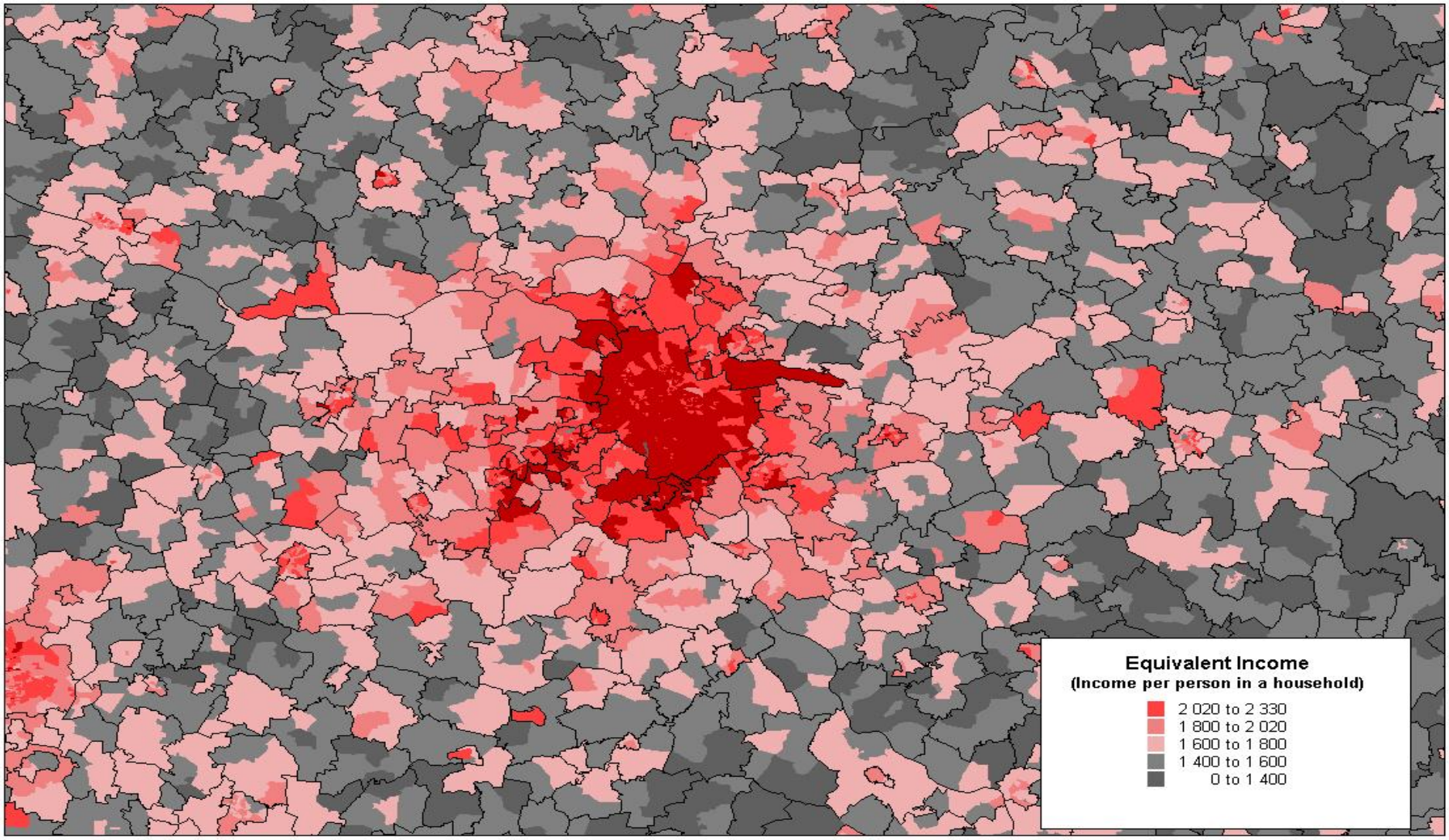


Statistical area CMC xx from Acxiom Commercial data





Statistical estimation of Acxiom Economical Stability Indicator in Sopot at the level of households. We can compare this spatial data with georeferneced data concerning Telco technology, sold services or particular index to find answers for more sophisticated questions

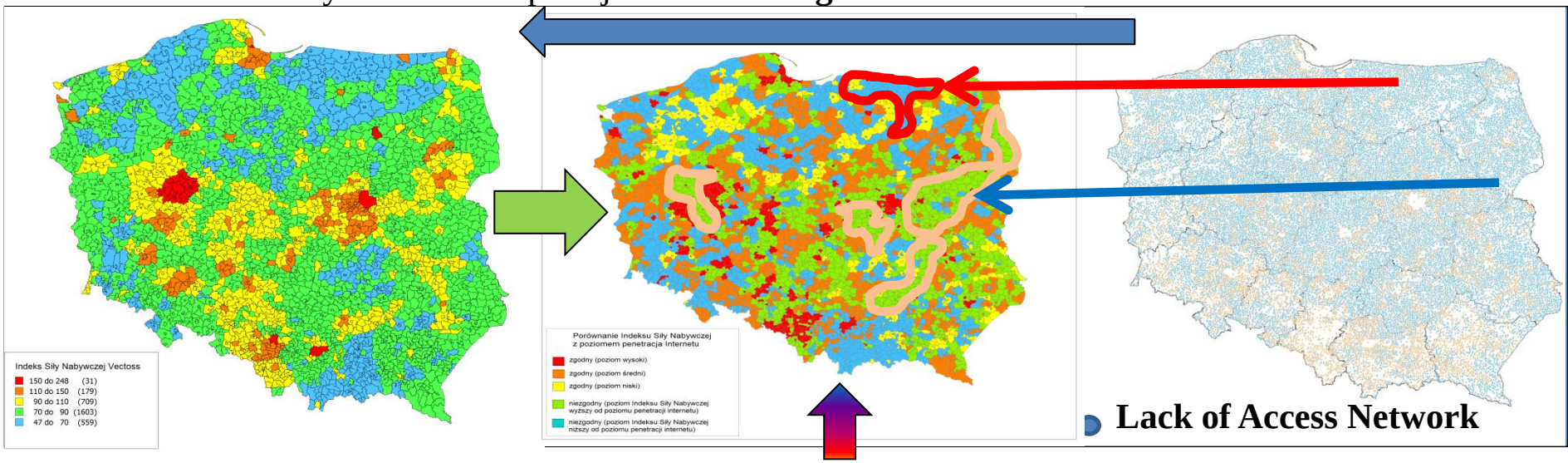


Statistical estimation of Equivalent Income (income per person in a HH) in Warsaw agglomeration at the level of CMC13 areas .We can build correlation with internet penetration and try to find the same correlation in other region.

Data usage 3

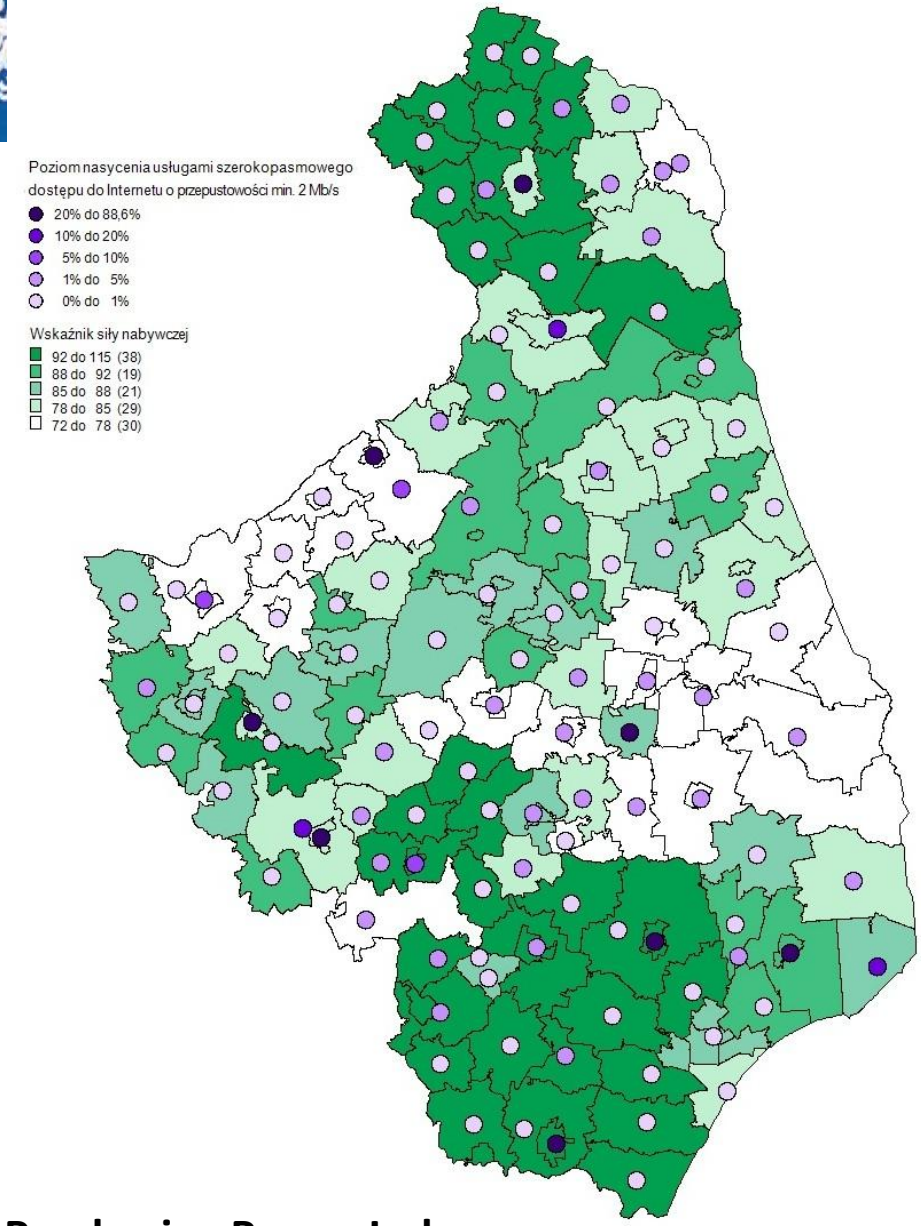
Inventory indicator helps adjust **Purchasing Power Index**

Inventory outcomes

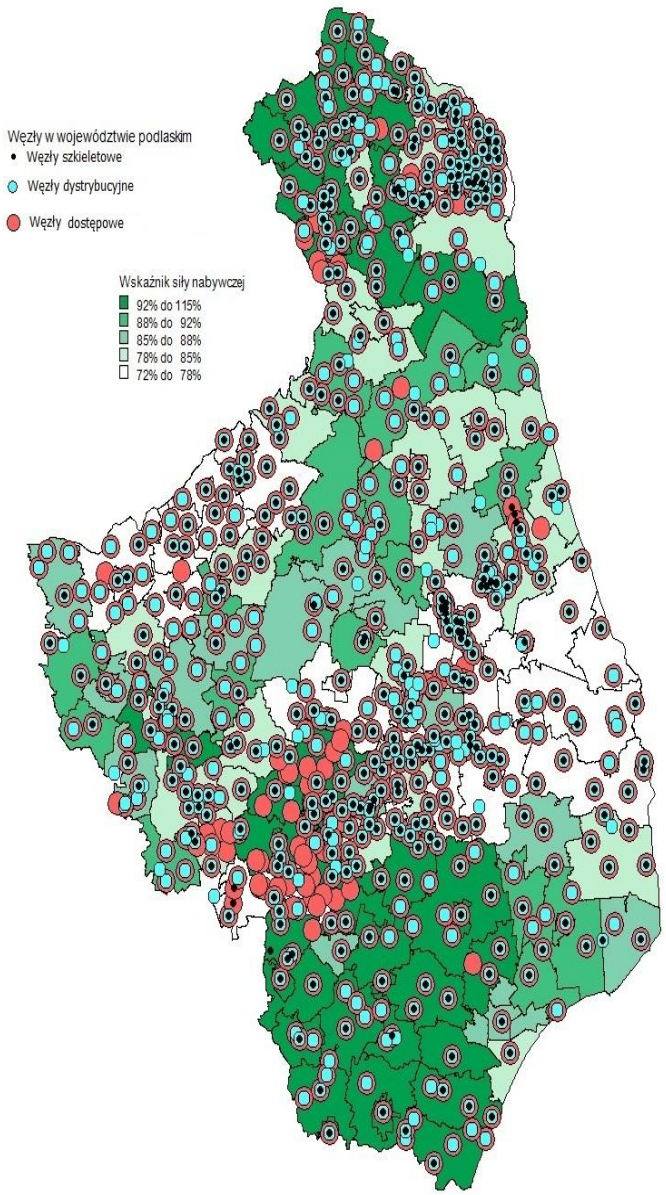


PPI help us to understand market phenomenon and define right market

International supermarket chain operating in the territory of Poland for the project launch online sales applied to the UKE on the data of the penetration of Internet access services at the municipal level.
Supermarket chain management expect that this information help to find optimal location for market with e-sales functionality.



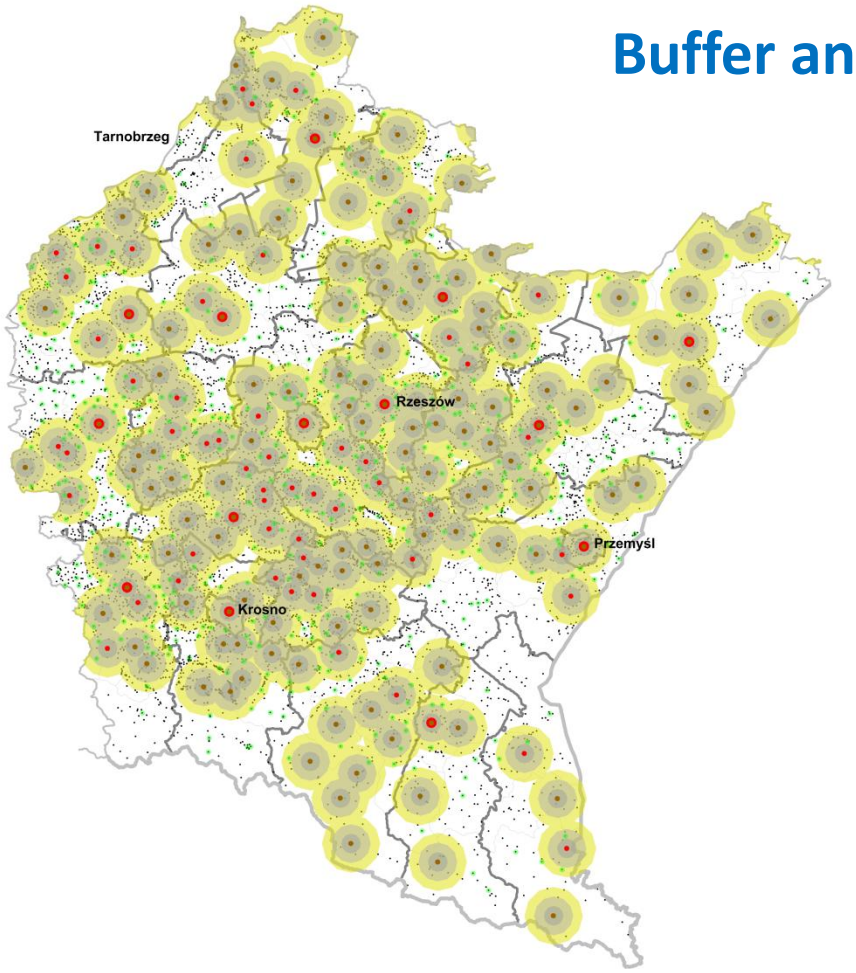
Purchasing Power Index versus density of broadband Internet serwices



Purchasing Power Index versus Network nodes location

Buffer analyses

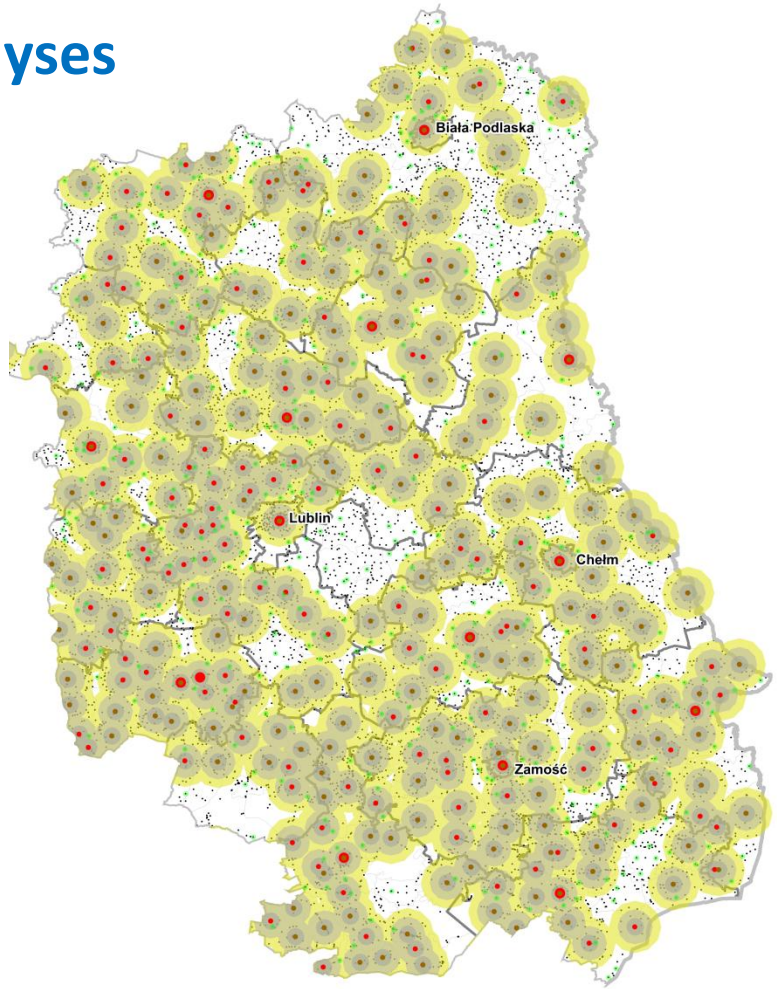
Porównianie projektu "Rozwój Polski Wschodniej" z istniejącą siecią światłowodową
woj. Podkarpackie



WOJ_SYS	Województwo	w ramach RPW			węzły światłowodowe wg inwentaryzacji 2012	miejscowości w obu zbiorach*
		węzły szkieletowe	węzły dystrybucyjne	łącznie		
18	PODKARPACKIE	14	169	183	647	130

miejscowości
istniejące zakończenia światłowodowe
inwestycje w ramach RPW - węzły szkieletowe
inwestycje w ramach RPW - węzły dystrybucyjne
bufor 6km wokół węzłów (w ramach RPW)
bufor 4km wokół węzłów (w ramach RPW)
bufor 2km wokół węzłów (w ramach RPW)
Rzeszów największe miasta regionu
granice województw
granice powiatów
granic gmin

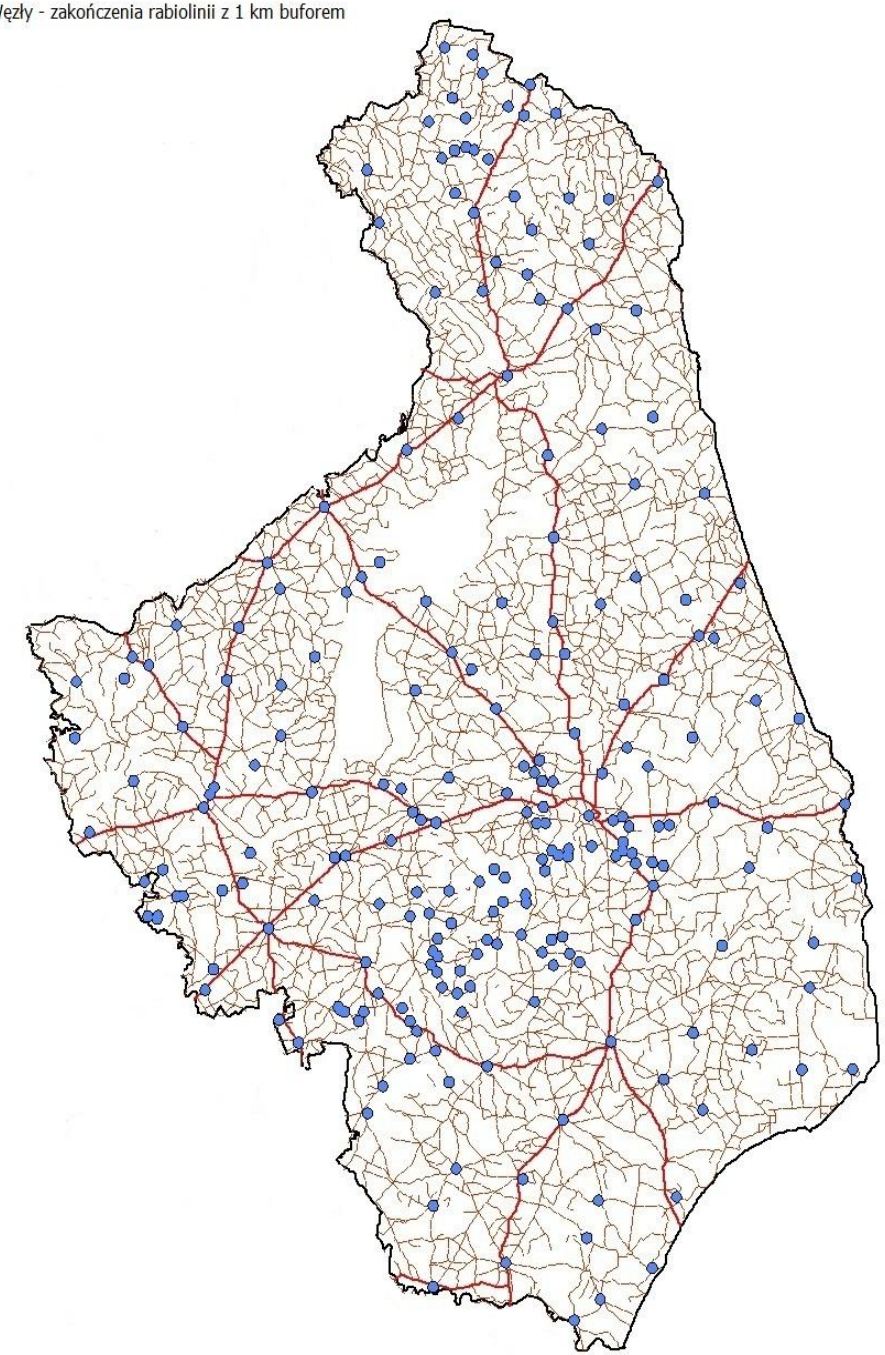
Porównianie projektu "Rozwój Polski Wschodniej" z istniejącą siecią światłowodową
woj. Lubelskie



SYS	Województwo	w ramach RPW			węzły światłowodowe wg inwentaryzacji 2012	miejscowości w obu zbiorach*
		węzły szkieletowe	węzły dystrybucyjne	łącznie		
	LUBELSKIE	15	303	318	633	188

ejscowości
niejące zakończenia światłowodowe
estycje w ramach RPW - węzły szkieletowe
estycje w ramach RPW - węzły dystrybucyjne
bufor 6km wokół węzłów (w ramach RPW)
bufor 4km wokół węzłów (w ramach RPW)
bufor 2km wokół węzłów (w ramach RPW)
Lublin największe miasta regionu
granice województw
granice powiatów
granic gmin

Węzły - zakończenia rabiolinii z 1 km buforem



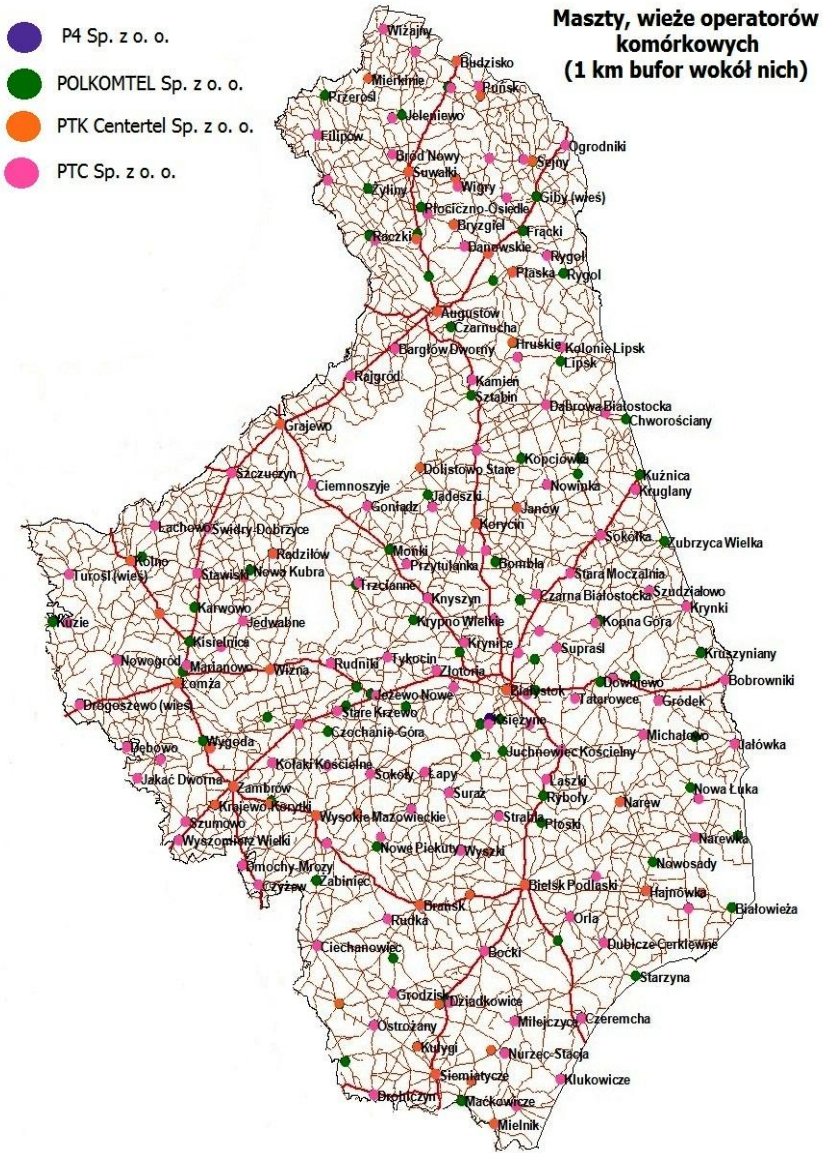
P4 Sp. z o. o.

POLKOMTEL Sp. z o. o.

PTK Centertel Sp. z o. o.

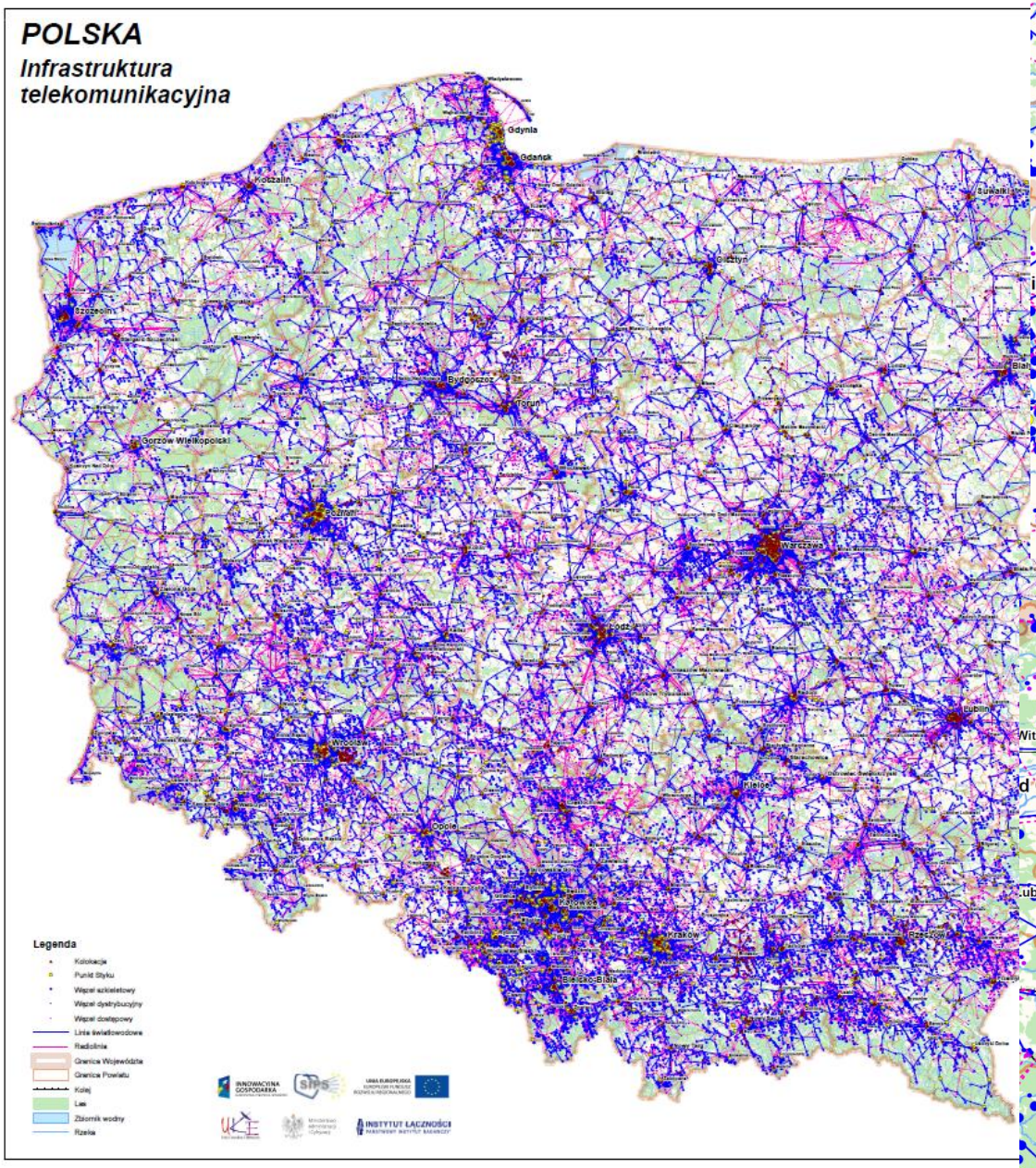
PTC Sp. z o. o.

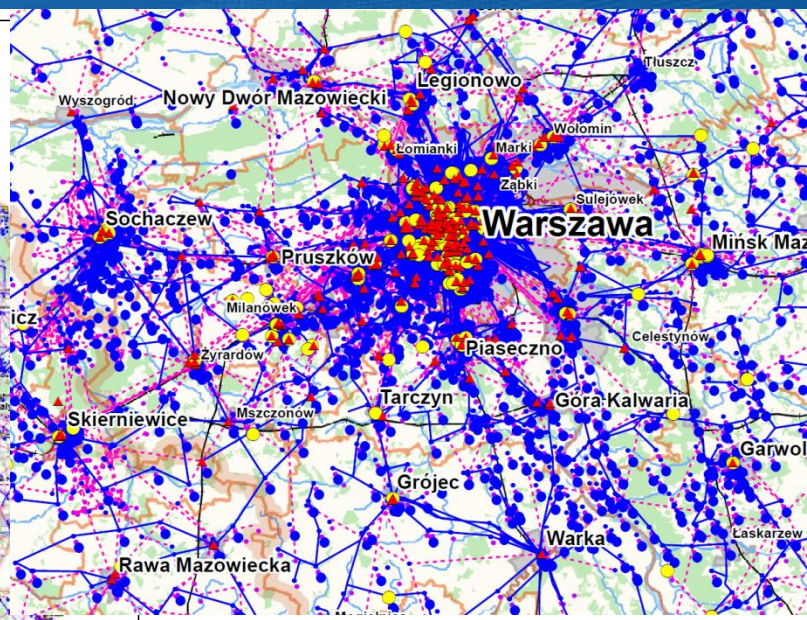
Maszty, wieże operatorów komórkowych (1 km bufor wokół nich)

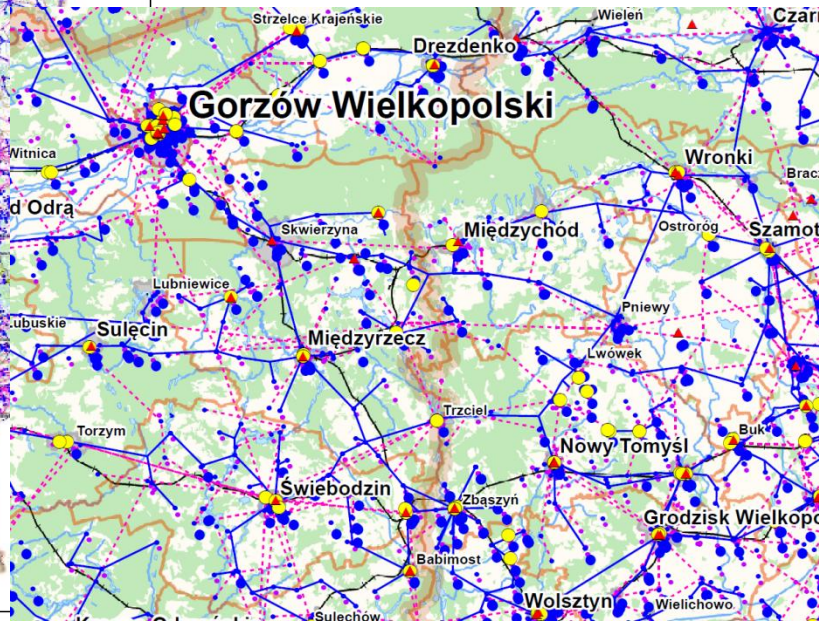


Maps (network location, network coverage, investment location)

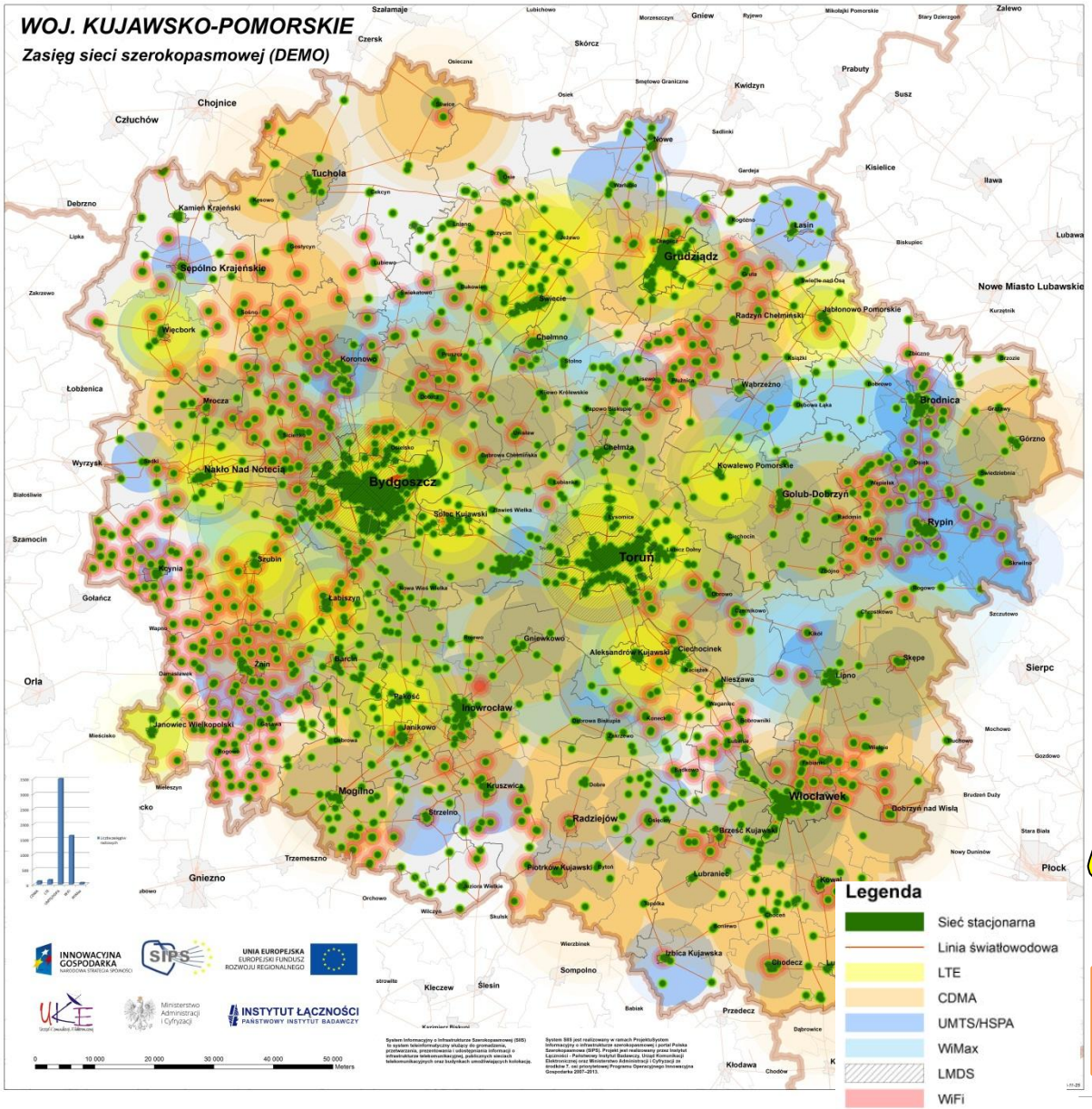
Maps

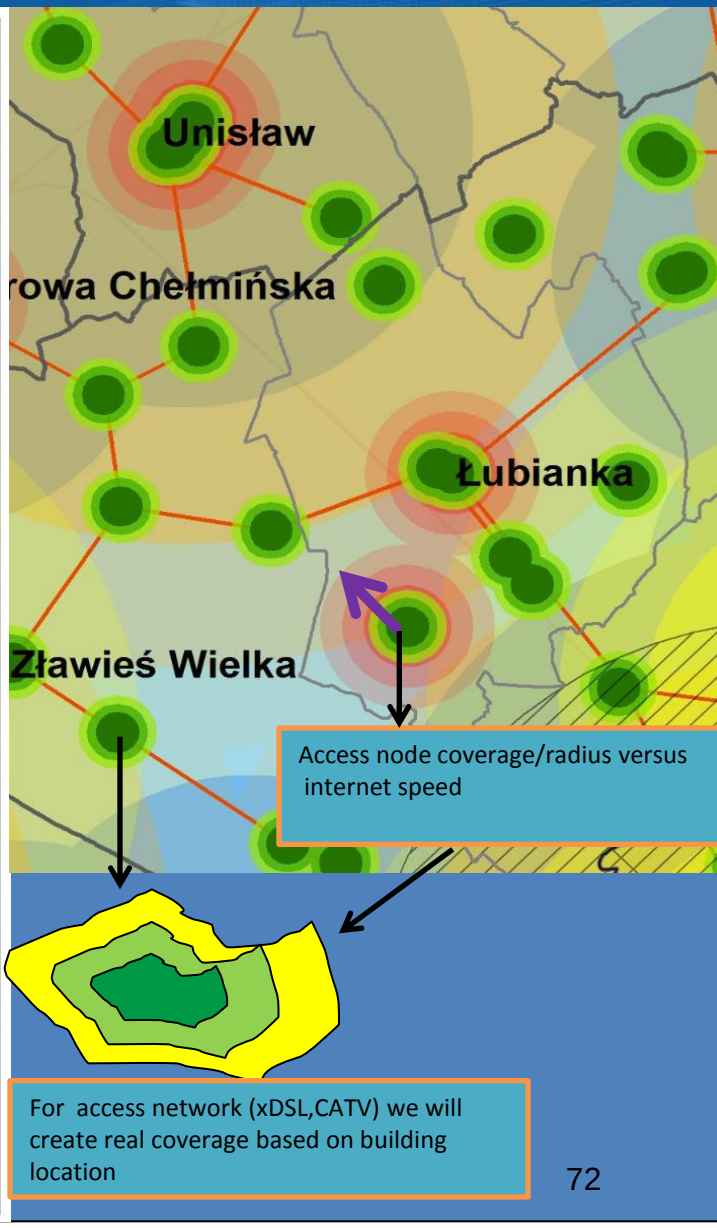

POLSKA
Infrastruktura telekomunikacyjna
Legenda
Kolokacja
Punkt Styku
Węzeł szkieletowy
Węzeł dystrybucyjny
Węzeł dostępowy
Linia światłowodowa
Radiolinia
Granice Województw
Granice Powiatu
Kolej
Las
Zbiornik wodny
Rzeka

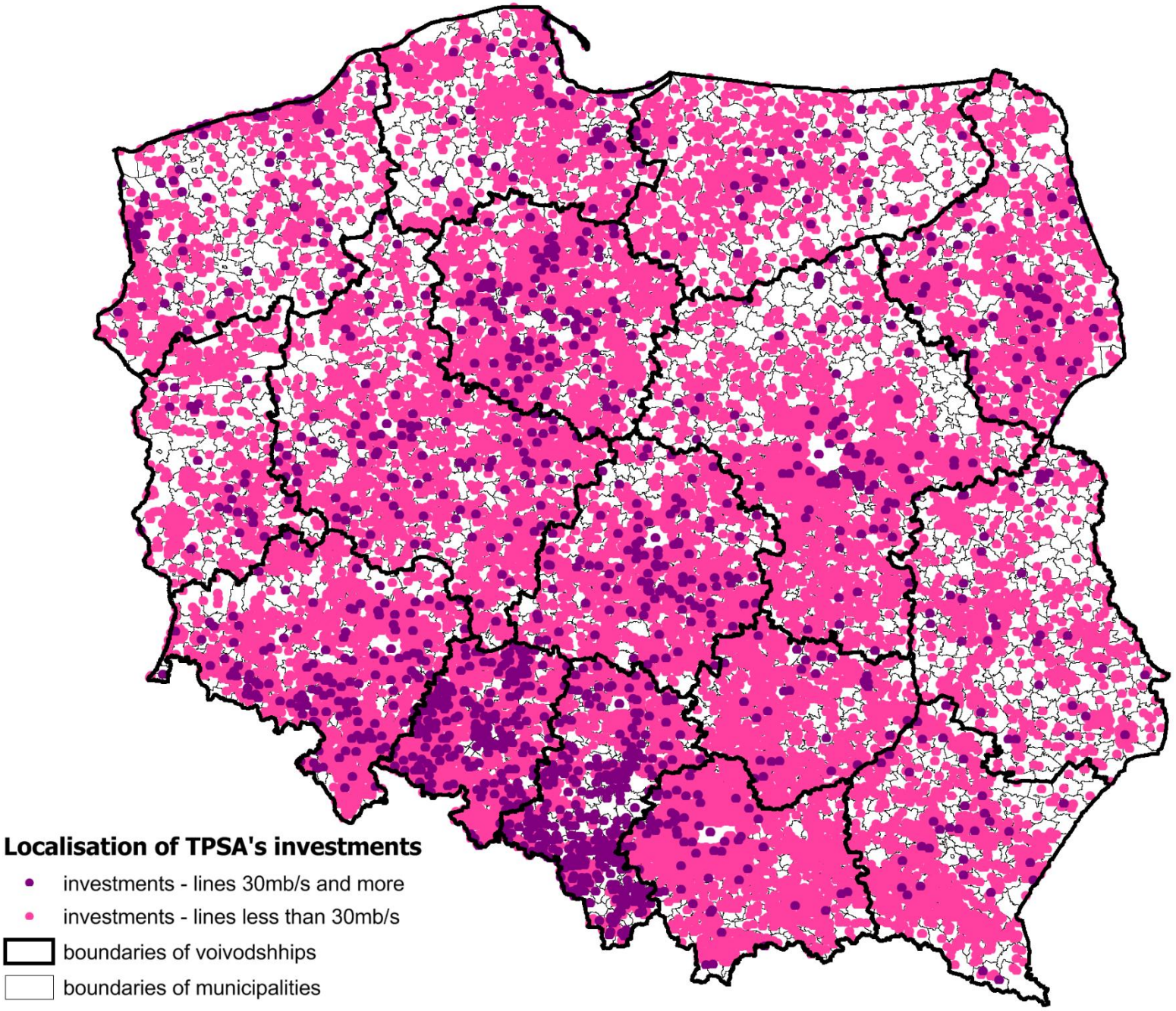

Legionowo
Nowy Dwór Mazowiecki
Wyszogród
Tłuszcz
Wołomin
Łomianki
Marki
Ząbki
Sulejówek
Warszawa
Sochaczew
Pruszków
Mińsk Maz
Milanówek
Piaseczno
Celestynów
Żyrardów
Tarczyn
Góra Kalwaria
Skierniewice
Mszczonów
Grójec
Warka
Łaskarzew
Rawa Mazowiecka

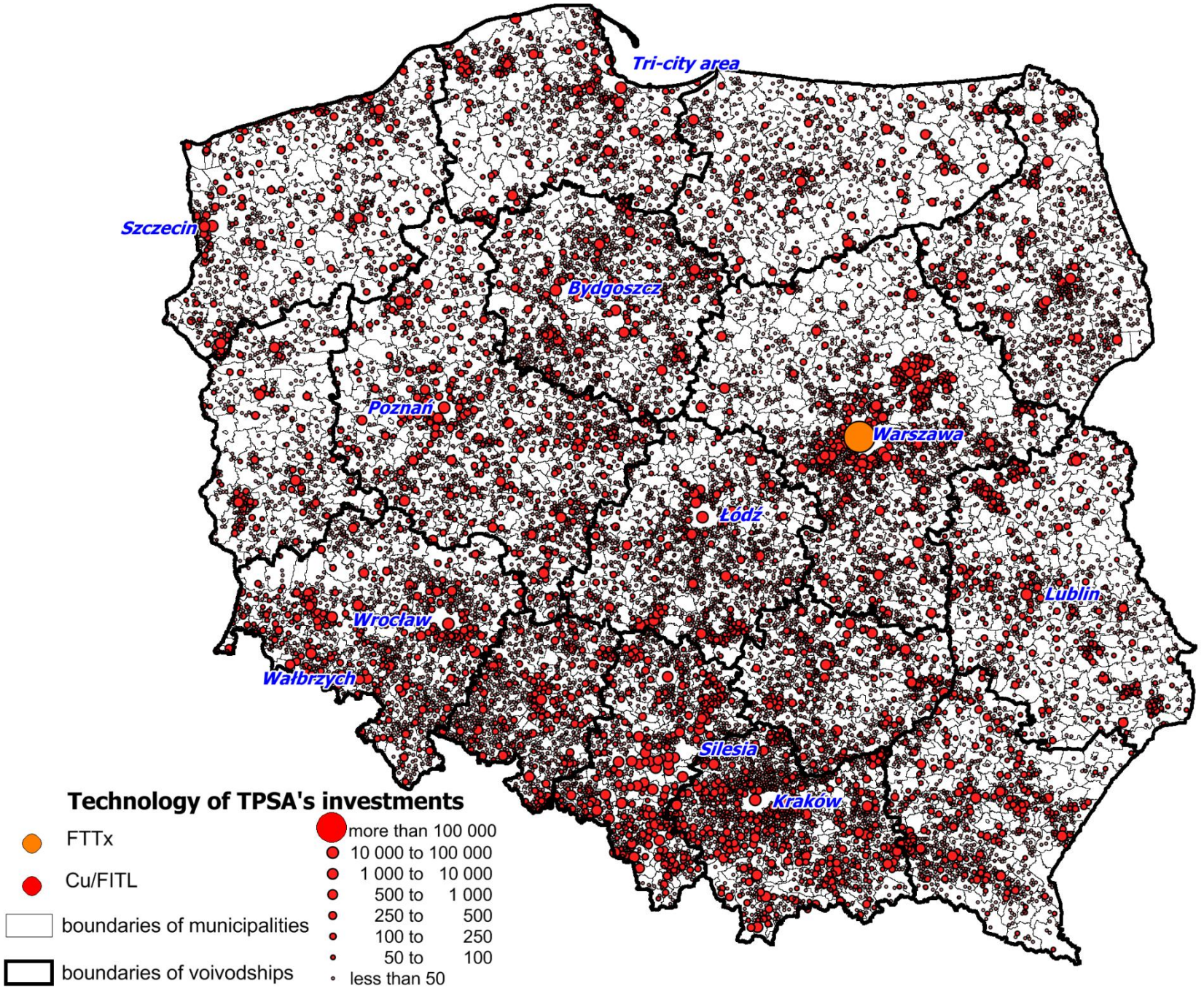

Strzelce Krajeńskie
Drezdenko
Gorzów Wielkopolski
Witnica
Wronki
Międzychód
Skwierzyna
Ostroróg
Lubniewice
Sulęcin
Międzyrzecz
Pniewy
Lwówek
Trzciel
Torzym
Nowy Tomyśl
Świebodzin
Zbąszyń
Babimost
Wolsztyn
Wielichowo

Network coverage map

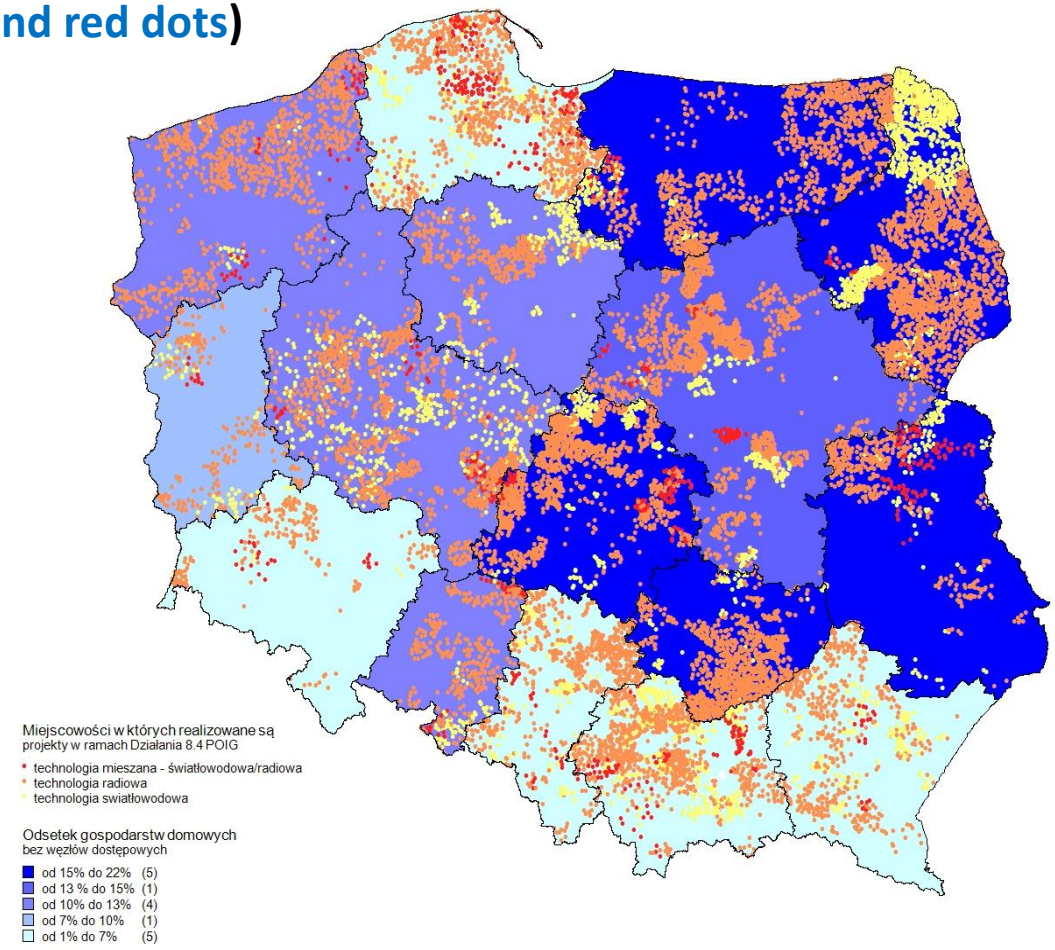





Localisation of TPSA's investments
investments - lines 30mb/s and more
investments - lines less than 30mb/s
boundaries of voivodshhips
boundaries of municipalities


Tri-city area
Szczecin
Bydgoszcz
Poznań
Warszawa
Łódź
Lublin
Wrocław
Wałbrzych
Silesia
Kraków
Technology of TPSA's investments
FTTx
Cu/FITL
boundaries of municipalities
boundaries of voivodships
more than 100 000
10 000 to 100 000
1 000 to 10 000
500 to 1 000
250 to 500
100 to 250
50 to 100
less than 50

Last miles projects are in mix radio-fiber and fiber technology (dark orange and red dots)



Action 8.4 dedicated for small and medium enterprises in the context of areas without access networks

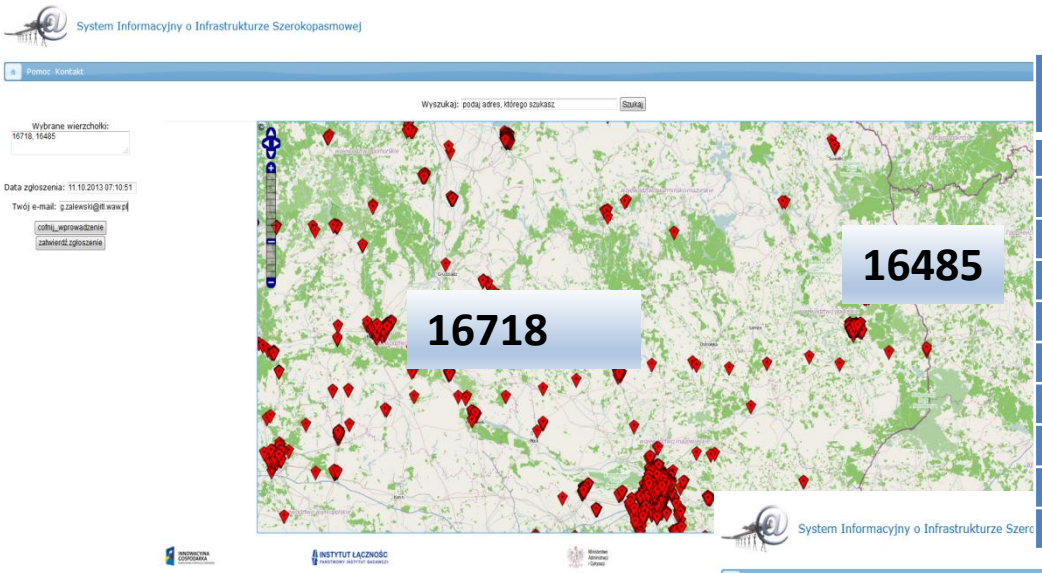
Development trends for mapping system (SIIS)

Improved law, new functionality, uniform system to fulfill the report obligations of operators

Improved law act

- Purpose-to provide a reliable source of information
- Main changes
  - Added information about services.
  - Lack of request since 2014. Obligation to send data to 31 March every year.
  - Adaption to change ownership.
  - Improved dictionaries (transmission systems access technology, cable type etc.)

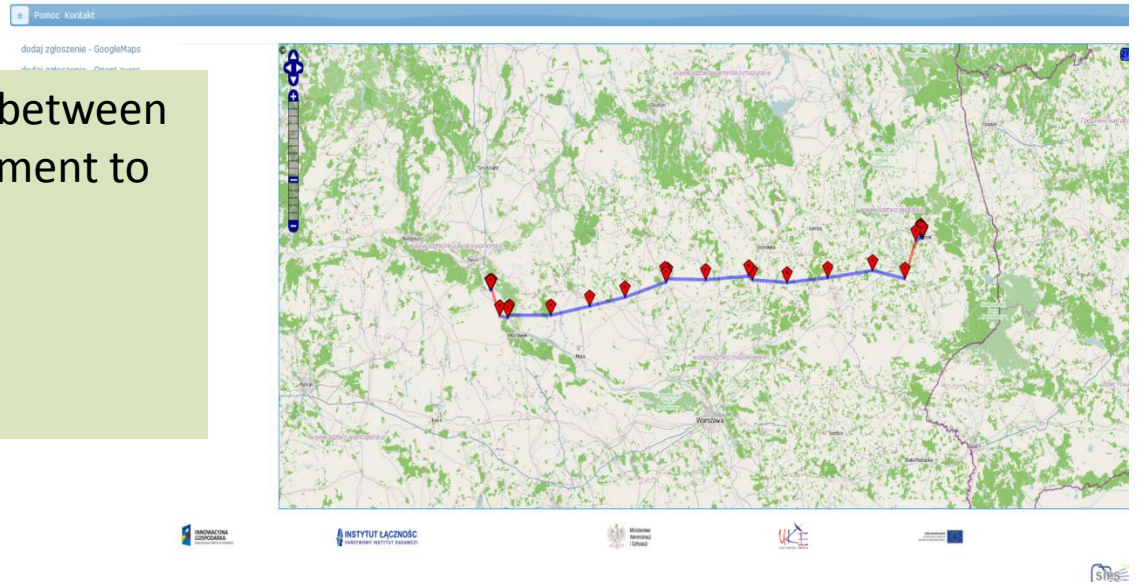
How find optimal connection between two points through FO network?



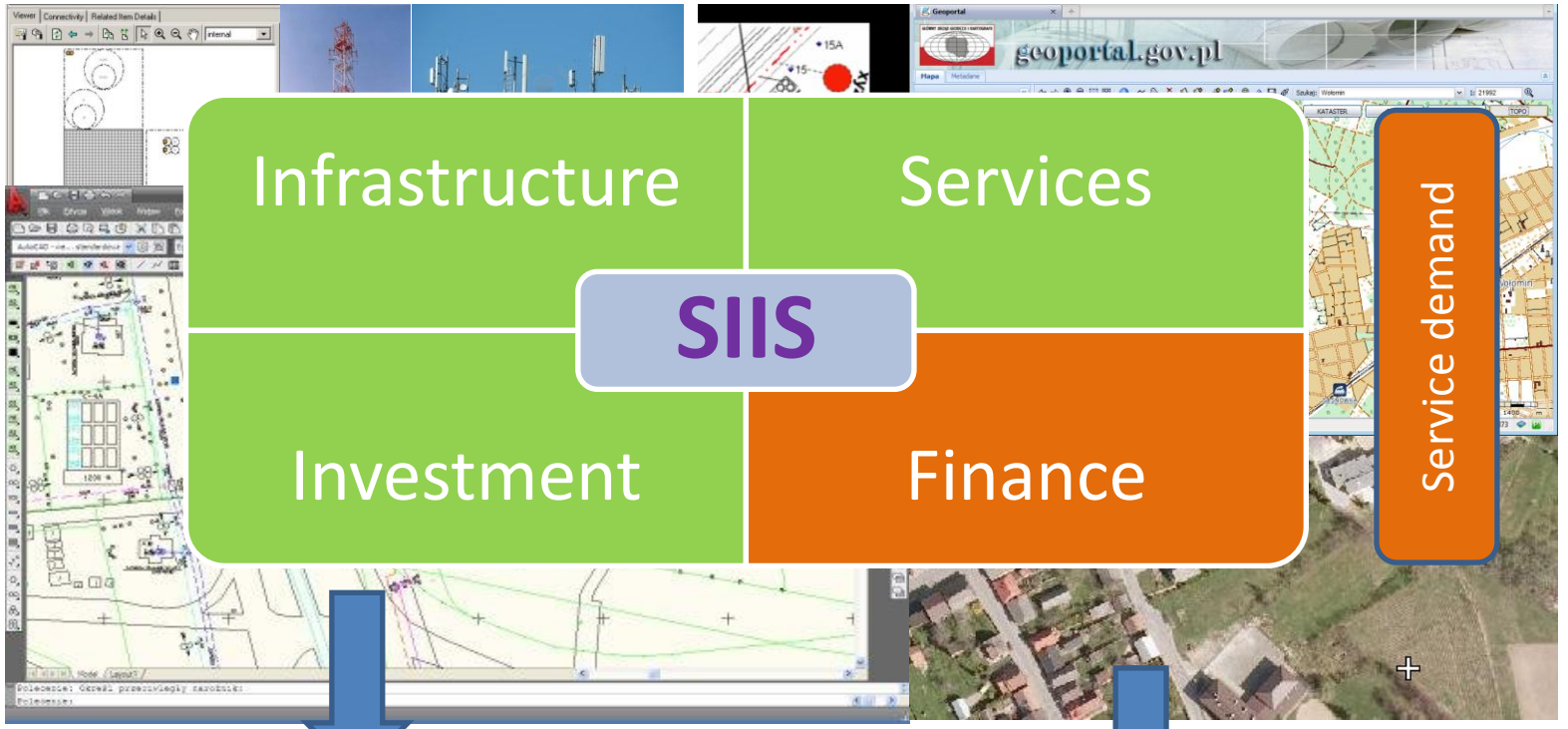
POŁĄCZENIE $d_n(q_1,q_2)$	KOSZT POŁĄCZENIA k_n	Czy wykorzystano połaczenie?
$d_1(1,2)$	k_1	0
$d_2(1,3)$	k_2	1
$d_3(1,...)$	k_3	0
$d_4(1,n)$	k_4	1
$d_5(2,3)$	k_5	1
$d_6(2,...)$	k_6	0
$d_7(2,n)$	k_7	0
$d_8(3,...)$	k_8	0
$d_{...}(3,n)$	$k_{...}$	0
$d_{n(n-1)/2}(...,n)$	$k_{n(n-1)/2}$	1

The algorithm to find optimal route between two points on the basis of the assignment to the edges of the graph weight (cost):

- Number of free fibers
- The cost of construction
- The distance between nodes, etc..



Uniform system for entities



Migrations to passive atlas and one step shop

Reporting obligations :NRA, EU, geographic segmentation, Central Statistical Office

Thank you for your attention

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Department of Infrastructure Development

m.sliz@uke.gov.pl
m.ostanek@uke.gov.pl