Population grid based evaluation of support for the expansion of broadband in sparsely populated areas – Experiences from Finland (CEQ 18)

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Outline

- Background of the CEQ 18
- Approach used to answer the CEQs 18
- Short summary of the main findings
- Limitations of the study
- Recommendations for the RDP ex post evaluation in 2023

Background

Evaluation question 18 : To what extent have RDP interventions enhanced the accessibility, use and quality of information and communication technologies (ICT) in rural areas?

- **Priority I**: Outcome assessment in Finland 2014-2020
    - Common results/target indicator R25: Percentage of rural population benefiting from new or improved services / infrastructures (ICT).
    - Additional indicators:
        - Number of village broadband network projects
        - Coverage of village broadband network projects
        - Internet access on farms
- **Priority II**: Wider impact assessment of the telecommunication policy in Finland 2010-2018 (National needs and expectations)

Approach used to answer the CEQ

Infrastructure

Communities

Input → Output → Outcome → Impact

RDP

Overall aims:
In order to maximize the economic benefits of broadband:

- Develop the broadband infrastructure
- Recognize the importance of the education for a long-term development of knowledge society
- Promote digitalization

24,8 million €

Expansion of the broadband

The benefits of broadband

Population development

Judgment Criteria	Indicator	Methods	Data
Expansion of the broadband	R25: Percentage of rural population benefiting from new or improved services / infrastructures (ICT).	GIS, DiD, panel regression	Application forms, Payments, National registers, National population grids, Availability of broadband
	Number of village broadband network projects	Survey	Application forms, Payments, National registers
	Internet access on farms	GIS, Survey	Farm structure survey

Deepen the analysis of expansion of the broadband because the support for is expansion of the broadband is predicted to decline.

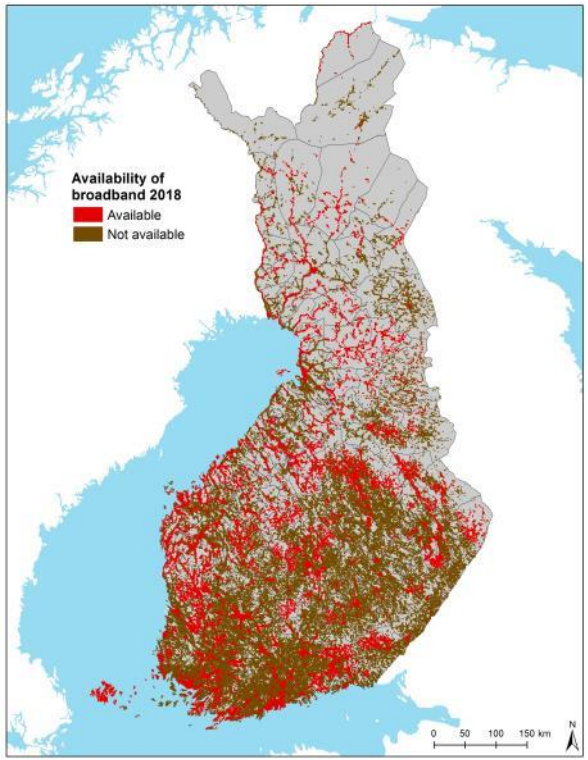
Could broadband construction support enhance local development capacities and, at the end, increase or maintain population (an indication of balanced territorial development of rural communities (art 4.c. Regulation 1305/2013)?

R25: To what extent have RDP interventions enhanced the accessibility, use and quality of information and communication technologies (ICT) in rural areas? **(PRIORITY I)**

Additional national expectations and information needs **(PRIORITY II)**

Approach used to answer the CEQ

Availability of broadband



Annual data of the population in 2010-2018 in population grids (1km*1km) (Statistics Finland)

+

Availability of the broadband in population grids 2018 (Traficom)

Fast broadband projects and commercial areas (Traficom: Finnish Transport and Communications Agency)

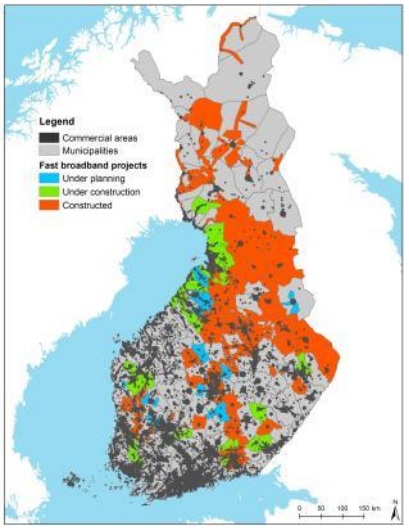
+

Detailed information of the broadband projects (e.g. construction years etc.) (Traficom)

1. GIS spatial analysis

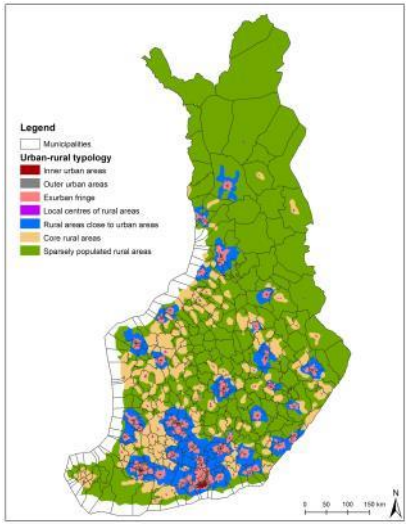
Panel data of the population development and the availability of broadband from the years 2010-2018

2. DiD regression technique



Fast broadband projects

Urban-rural typology



DiD-regression modelling as an approach for evaluation and impact assessment

Annual population change inside the municipality in 1km * 1km population grids during the years 2010-2018

Dummy variable indicating the time when the treatment started

$$\Delta Population_{it} = \beta_1 + \beta_2 years_i + \beta_3 treatment_i + \delta(years_i * treatment_i) + c_i + e_{it}$$

Dummy variable identifying the group exposed to the treament (1= Broadband is built, 0= Broadband is not built)

DiD interaction term describing the combined effect between time and treated.

If DiD-term is positive, construction has had a positive impact on population development.

Regression model is estimated with random effect model using R's lme4 (=Linear Mixed-Effects Models using "Eigen" and S4) and plm (=Linear models for Panel data) packages by using matching (genetic matching) and non-macthed data.

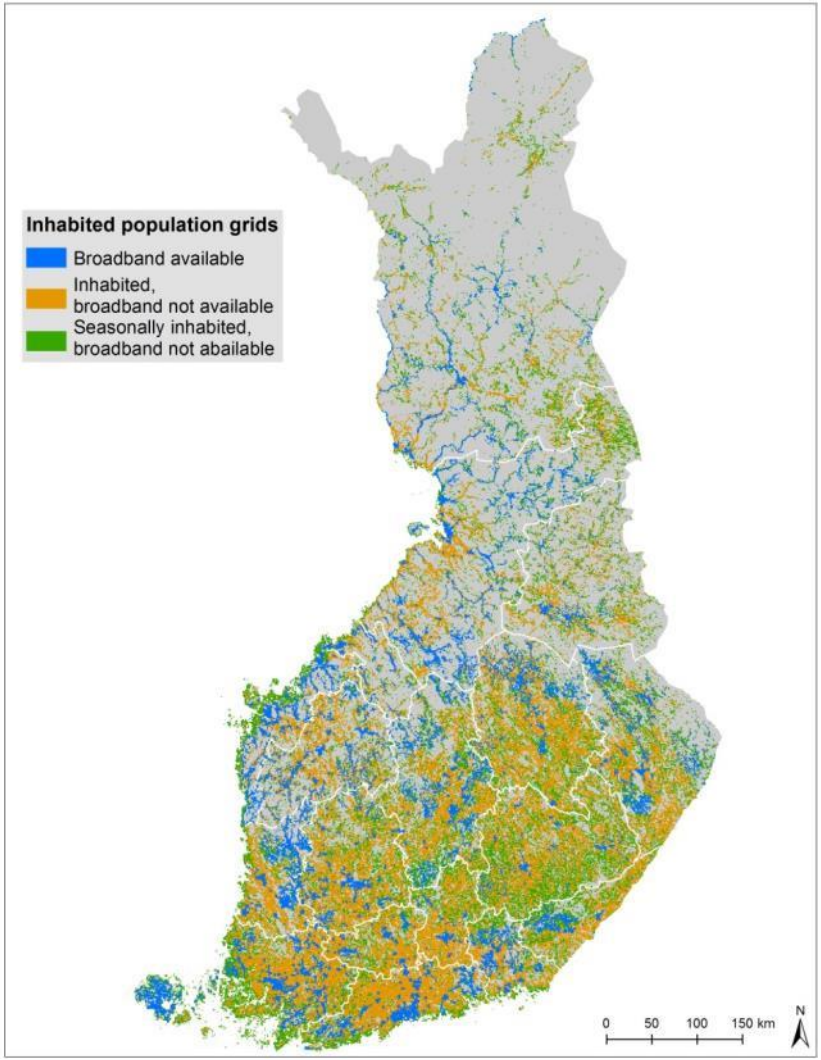
Availability of the broadband in urban-rural typology

(Results of the GIS spatial analysis)

Local differences are wide due to fragmented construction and poor coordination.

Table 2. Number of population with or without broadband availability in urban-rural typology in 2018.

Urban-rural typology	Population			
	No broadband available		Broadband available	
	n	%	n	%
Inner urban area	8360	0,5	1832874	99,5
Outer urban area	33845	2,4	1389569	97,6
Exurban fringe	230070	37,1	389530	62,9
Local centres of rural areas	50059	17,4	238298	82,6
Rural areas close to urban areas	233746	60,0	156096	40,0
Core rural areas	243707	40,1	363631	59,9
Sparsely populated rural areas	150136	54,1	127486	45,9
Total	949923	17,4	4497492	82,6



Outcomes of the indicators:

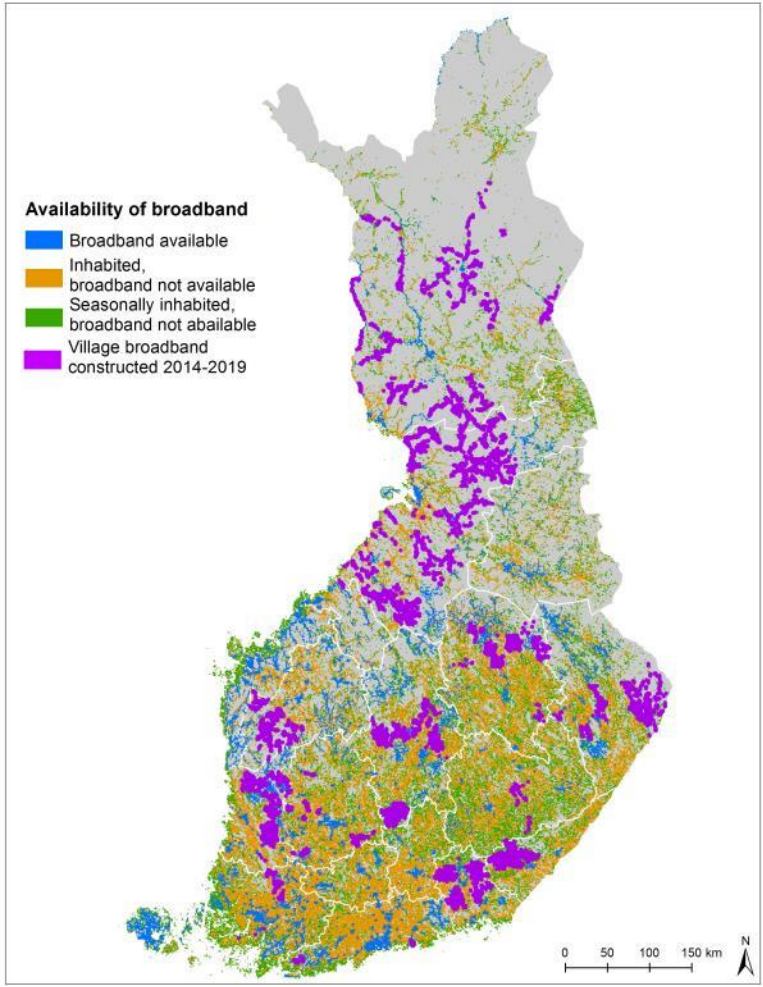
Common results/target indicator R25:

- 1,014,440 potential benefactors (T24 = 26.53%). This figure has been calculated by taking into account the rural population of all the municipalities in which the broadband projects have been implemented.
- In 2017, the population of the mainland Finland according to the GIS-based classification of urban-rural areas was 1,556,144 (Statistics Finland). On this basis, the share of the rural population potentially benefiting was 65.2%.

Additional indicators:

– Number of village broadband network projects: 28 completed broadband projects (projects with final payment), 26 on-going broadband projects, 22 approved broadband projects

– Internet access on farms: in 2016 about 76% of the farms used internet and around 56% of the farms had the broadband.



Impacts: Results of what if –analyses (Impact assessment)

The effect of the RDP is positive in terms of population trends in rural areas.

1. If the broadband had not been built, the population decline would have been over 11% between 2010 and 2018.
2. If broadband had been built already in the year 2010, the population development would have been slightly positive in built areas in 2018.

Table 3. Estimated effects of broadband construction on population development based on DiD-regression modeling.

Variable	Observed population development		Results of what if –analysis			
	Areas without broadband available	Areas with broadband available	If the broadband had not been built		If broadband had been built already in the year 2010	
			Estimated population development	Difference to observed development	Estimated population development	Difference to observed development
Population in 2018 (n)	227352	59364	56292	-3072	62078	2714
Change of the population 2010–2018 (n)	-17925	-3362	-6434	-3072	2714	6076
Change of the population 2010–2018 (%)	-7,9	-5,7	-11,4	-5,8	4,4	10,1
Annual change of the population (%)	-0,9	-0,6	-1,3	-0,6	0,5	1,1

Main limitations of the approach

- Requirements for the GIS database and regression models are high (e.g. grid databases).
- DiD-regression modeling is based on “average development” - deviations from this are possible.
- Based on the Maryland Scientific Methods Scale (SMS) the quality of the evaluation is grade 3 or 4 depending on the estimation methods and matching data used (SMS is a five-point scale ranging from 1, for evaluations based on simple cross sectional correlations, to 5 for randomized control trials)
  - Nb! A quality rating of 5 (randomized control trias, RCT) is not possible for policy impact assessment (current policy practices do not allow the completely randomized design for support for the expansion of broadband)

Recommendations for the RDP ex post evaluation in 2023

- GIS-analysis is needed to **show the local differences for the better coordination in the future**
- The **results support the existing telecommunication policy in Finland**, which has promoted the construction of broadband, especially in sparsely populated rural areas -> **support for the expansion of broadband balance the territorial development**
- The **impacts of the broadband construction are ”delayed”** in the areas.
    - A high demand for long time series and panel datasets
- Other recommendations based on our experiences in Finland:
    - Use of accurate spatial data and GIS (population grids)
    - Panel regression models and random effect estimation
    - Matching methods: the estimation of non-matched and matched data
    - What if –analysis to concretise the impacts

Thank you!

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