Response to the consultation on the draft 'BEREC Guidelines on Geographical surveys of network deployments'
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21 November 2019

Introduction and initial comment on the Purpose and Virtues of Article 22.

Overall the FTTH Council congratulates BEREC on what it feels is a generally good effort at setting out a common approach to geographic delineation. The Council also appreciates the consultation process especially the Workshop held on the 22 October 2019 in Brussels.

From the FTTH Council's perspective there are three main uses of geographic segmentation which can be classified as (a) the current Article 22 calculation with the attendant implications in the Code (b) determining geographic markets for the application of SMP analysis and remedies and (c) the application of State Aid rules. The FTTH Council believes that there should be a consistent methodology used and applied for all three contexts and believes the draft guidelines push strongly in this direction. This is entirely appropriate and in line with the theme of the code and good regulatory practice generally. Furthermore, those operators who would seek to limit the reporting requirements on operators consider that only broadband or at most, 100Mbps is sufficient information. This is not and cannot be consistent with intention of the code which explicitly sees the geographic delineation of markets as being used to designate areas where VHCN will not become available in the foreseeable future.

The FTTH Council believes that NRAs and BEREC have a duty to gather data that can allow an analysis of geographic markets that allows a consistent approach to VHCN delivery now and into the future across all regulatory and State functions. However, there is a balance to be struck and a coherence to the approach suggested that is not an obvious justification for the data being collected. The data that is collected might be used in a State Aid context, however this suggests not only that the data will be sufficiently refined, but that the 3 year forecast suggested will coincide exactly with the State Aid application. In all likelihood a second analysis will have to be conducted in a State Aid context by a party other than the NRA (since NRAs have no formal role in State Aid procedures) which raises the question, why collect the data at all?

It is also worth noting that the maximum 3 year forecast provided for in the code is not aligned with the now five year cycle associated with the market analysis procedure such that another forecast process will be required in the market analysis work of NRAs.

While there is a provision that suggests that NRAs 'may' collect forecast market data for up to three years, BEREC's belief that NRAs 'should' conduct such forecasts looks misplaced.

Article 22 allows a geographic analysis of broadband markets within the EU and with what are clearly multiple purposes. These purposes involve the application of a geographic analysis for assessing the geographic scope of networks, a scope which is relevant in the context of Article 64 for market definition, Article 86 for Universal Service obligations but also in relation to associated areas relating to access conditions and specific business models.

In addition the location of VHCN is relevant in all of these areas too since many aspects of the code are specific to a context in which the relevant network is designated as VHCN. The geographic scope of VHCN may also become relevant in an Article 64 context.

Although Article 22 links the activities of NRAs to a State Aid perspective by inviting NRAs to identify areas where VHCN or network upgrades to at least 100mbps are not likely to become available over the forecast period and to organise private or public bodies to make the necessary

investments with Article 22(5) specifying a link to State Aid financing and the use of the geographical survey information it should be understood that the geographic analysis required for a formal State Aid application will go someway beyond anything collected in an Article 22 context and the reporting requirements in this context should reflect this fact.

It is also important to look to the rights of data collection in the same context. Article 20 set out the rights of NRAs to collect any data deemed necessary to conduct their geographic analysis in order to complete their regulatory tasks. There are no limitations according to network type of speed in any fashion. There is of course a proportionality requirement which exists in all instances and the contradiction inherent in the timelines (three years for State Aid but very unlikely to coincide with Article 22, five years for market analysis) as well as the detail of data collected will likely restrict the data collected on these grounds. It may be that simply establishing the appropriate reporting lines in the first instance can make future reporting easier and not an unreasonable burden on operators particularly if the data required is part of the data set reported by the operator internally. This might be true of future network forecasts;

Article 22 (1) ……In particular, national regulatory authorities ***and, where necessary for performing their tasks, other competent authorities*** shall have the power to require those undertakings to submit information concerning future network or service developments that could have an impact on the wholesale services that they make available to competitors***, as well as*** information on electronic communications networks and associated facilities, which is disaggregated at local level and sufficiently detailed ***to enable*** the geographical survey and ***designation of*** areas in accordance with Article 22.

Where the information collected in accordance with ***the first subparagraph is insufficient for*** national regulatory authorities***, other competent authorities and BEREC to carry out their regulatory tasks under Union law, such information may be inquired from other relevant undertakings active in the electronic communications or closely related sectors***.

……..

In practice therefore, not only do NRAs have the right to collect all necessary data to identify the geographic scope of broadband networks (including those that can and will be upgraded to 100Mbps) as well as the geographic scope of VHCN networks, now and into the future, they have an obligation to do so in the general framework of appropriateness and proportionality which will likely mitigate against extensive data reporting, particularly on prospective network plans.

Comment on the Consultation Document

The FTTH Council Europe has always advocated a geographically differentiated approach to regulation with a strong preference for infrastructure based competition in urban areas and something else beyond that area, either relying more on services based competition or even public financing depending on the area in question. Regulation, existing and signalled, has a profound impact on the market operations. Credible, predictable and stable policies create a framework in which capital can make strategic choices over the longer term. It is in everyone's interests to have market boundaries that are stable, not for the administrative burden it might

impose on Regulators but rather because of the uncertainty it can create in a context where returns may take 20 years to be realised. It is better if investors understand what rules will play where.

The FTTH Council believes that determining the drivers of geographic segmentation of markets should be done objectively based on independent data wherever that is possible so as to remove as much subjectivity from the analysis as possible. FTTH Council believes that any geographic delineation of broadband markets must take into consideration objective and durable data such as population density, topology and so on. Population density is one major driver of network build cost which in turn has a major impact on the scope of commercial network deployment. The most extensive and detailed cost modelling exercise conducted in Europe, and the only cost model that is fully open for scrutiny, was commissioned by the FTTH Council (and in which its Members co-operated and participated) and that study determined is the central role of density and associated built environment characteristics to cost. However, it must also be recognised that NUTS3 is a broad geographic scope and can contain many different regional variations.

In the FTTH Council cost model the population density analysis used NUTS3 classifications but was necessarily adjusted using other data sources to remove woodlands, mountains, rivers etc. from the geographic areas (more details are available in Annex 1 which is an excerpt from the relevant study).

That cost model assumed no infrastructure sharing and a full and correct application of the BCRD can lower the cost function of deployment but not the shape of that cost function. Importantly, without any infrastructure sharing that cost function suggests that in the absence of BCRD measures the cost function flattens dramatically around 500 homes per km2. That means that while costs still fall as density increases most of the cost savings have been achieved.

The fact is that over a forward looking time period, some areas can support competitive entry whilst others have a much less likely capacity to do so. Whereas population density as a parameter remains stable over time, other factors will change over time and innovation on construction methods on the one hand will constantly move the cost function making former marginal areas accessible to private investment. Superior analysis of current conditions on the ground will allow for a much-needed differentiation in construction conditions and therefore investment conditions. Population density therefore is a very important parameter that is largely ignored in the BEREC, which gives a good first indication of where VHCN networks have a favourable cost profile for construction. It works less well in identifying areas where network will not get built, as noted already deployment costs can vary due to innovations in deployment and the boundaries of where networks might get built change. While it is therefore not sufficient for an operator to base its construction and investment decisions on density alone and basing regulatory action on this parameter alone will risk leading to structural mistakes, it is not tenable to ignore such an important metric particularly in identifying areas where competitive network build might be reasonably expected. and an appropriate differentiation of regulation in these areas will be important for investors.

The FTTH Council is concerned therefore that a significant driver of cost in network deployment is population density there is little attention paid to this factor in the BEREC guidelines. As noted in Paragraph 25, data from national statistical offices on population

distributions is also available and may be a more useful and valuable source of data than network operators.

Specific Comments on the Consultation Document

The FTTH Council Europe is one of five members of the FTTH Council Global Alliance (FCGA). The FCGA is the platform for cooperation of the five global FTTH Councils. All FTTH Councils share a common goal: the acceleration of fibre to the home adoption. Each member of the FCGA acts as a powerful and independent organisation in their specific market. This regional focus gives the FTTH Councils a special strength to adapt their activities to the particular market situation in their area. Some common activities include the setting of definitions as to what certain terms mean as small variations interpretation can lead to big differences. The definition of Homes Passed as set out in the BEREC consultation document may be problematic in the Council's view.

Premises passed: The number of 'Premises Passed' is the potential number of premises that an operator can connect in a service area within a short period of time at affordable prices for the end user (connection fees), regardless of whether these premises are connected to the network. Typically, for a premise to be passed, this requires an existing network or network components (e.g. fiber splitter) deployed in close proximity to the premises. An operator may report a premise as passed only if, following a request from an end user, it commits to connect the house within normal connection fees, i.e. without any additional or exceptional cost if it is the standard commercial practice and, in any case, not exceeding the usual cost in the Member State, which may be defined by the NRA/OCA. Furthermore, the operator must be able to technically connect the end user, usually within 4 weeks from the date of the request.

The potential problem as the Council sees it is that speed of connection and cost can be relatively fungible. A better means to designate an area would be to state what can and cannot be in place for a premise to be deemed 'passed'. The FCGA definition of homes passed works in this way and is a more objective means to designate an area.

"Homes Passed" is the potential number of Premises which a Service Provider has capability to connect to an FTTH/FTTB network in a service area. Typically new service activation will require the installation and/or connection of a drop cable from the homes passed point (e.g. fiber-pedestal, manhole, chamber, utility-pole) to the Premises, and the installation of subscriber Premises equipment at the Premises. This definition excludes Premises that cannot be connected without further installation of substantial fibre plant such as feeder and distribution cables (fiber) to reach the area in which a potential new subscriber is located.

BEREC should also define the concept of 'premises passed' for FWA infrastructures, as applying the same definition as for fixed networks does not reflect the differences between the two types of networks.

While it is good that there is a harmonised approach on data sets and collection it is of serious concern that a reduced data set (upload and download speeds) is collected on fixed broadband parameters as per paragraph 42 (50) and while VHCN is set on a boolean basis (1 or 0), that set will potentially determine whether a network can be considered VHCN or not. BEREC has

yet to determine what would constitute an equivalent to VHCN as defined (FTTH/FTTB) and that must be assessed in relation to specific parameters set out in the EECC. BEREC could opt for a Boolean response if it is measuring whether the network is FTTH or FTTB, but if other forms of VHCN exist in BEREC's opinion, whatever these are, they may well change over time. It would make far more sense to collect data, at least in a QOS-1 form on about latency, jitter and other errors parameters at least using stylised considerations i.e. assuming some form of end user CPE just as is proposed in the mobile network assessment. BEREC could reasonably take a view that VHCN is only FTTH/FTTB and in that instance collect a Boolean response. In the alternative, A standard set of assumptions should be proposed for the EU much as proposed for measuring mobile parameters in Section 2.4.

The FTTH Council believes that this is important to measure these parameters on VHCN because they will likely change over time and it would make sense to have a data set that allows an updated view of network potential and which will allow a proper overview of the network environment.

It is not clear how Paragraph 44(53) to be interpreted? Does determining VHCN not require that all parameters are measured? seems to the FTTH Council that (a) resilience (b) error-related parameters as well as (c) latency and its variation should be measured for all networks even where this requires a set of assumptions about end user equipment.

In urban areas infrastructure based competition can drive investments especially where measures to reduce costs (sharing civils, in-building wiring) are in place. The geographic scope of contestable markets can be increased through effective cost reduction measures. Already today, Wholesale-Only operators are entering markets and delivering that infrastructure based competition in many markets such as the UK or Italy and Vertically Integrated competitors have also entered in other markets such as Spain and Portugal as well as Germany.

It is worth noting that Article 22 looks to map all broadband networks and in a number of instances requires assessments of VHCN and networks with one dimensional upgrades to 100mbps download speeds – there is no implied equivalence and even if Article 22 looks to both VHCN and 100mbps upgrades, Article 3 of the code means that NRA's focus must be on VHCN and the transition of VHCN networks. For this reason the FTTH Council believe that BEREC should advise those conducting the geographic surveys to make a distinction between the two categories when conducting their survey/issuing their questionnaires.

In Section 2.6 dealing with forecasts – there is too much emphasis on broadband (2Mbps) and 100mbps and not enough emphasis on VHCN and its drivers. While the FTTH Council strongly agrees with the need for forecasts and while it understands that 3 years is consistent with the State Aid Guidelines - to some extent this approach misses the point since the time period of Article 22 will only coincide with a State Aid analysis in exceptional circumstances and the 5 year period of Market Analysis is longer than the forecast proposed. Using objective and concrete data such as (appropriately adjusted) population density can allow a longer perspective to be taken at least to identify competitive build areas.

Question 1 In BEREC's current Public Consultation on the implementation of the Open Internet Regulation (paragraph 140), BEREC is requiring that the speed values required by Article 4(1) (d) of the Regulation EU 2015/202011 should be specified on the transport layer protocol payload, and

not based on a lower layer protocol. Is there any reason why this layer should not be used in proving information about speeds in the context of a Geographical Survey of Broadband reach?

Differentiated wholesale models may lead to different speeds on the transport layer for the same physical network (FTTH) at the same address. With unbundled optical fibre lines and layer 2 Bitstream access models (based on Ethernet) lower layer protocols should be used to reduce unnecessary and /or conflicting data sets and reach a common ground.

Question 2 Berec has considered several methods to calculate speed information according to the relevant fixed network. The development of these methods often requires information on the position of network infrastructure (for example, collecting the distance to the street cabinet or the switching centre). Do you consider information on location of infrastructures strictly required for the purpose of art 22? If so, what is the minimum information level related to network infrastructure that the Geographic Survey should collect and why?

No, this information is not required, especially not for fibre networks. There is no attenuation to speak of in fibre access networks, so such a demand for data is unreasonable.

Annex 1 Excerpt from the FTTH Council Cost Model on Density

Cost/Density relationship

A major component of the proposed extrapolation model is the cost-density relationship. It assumes that the cost to roll-out an FTTH network over a certain area can be calculated based on the household density and the number of households. It is true that the cost of a fibre network depends on many geographical parameters, the most important one being the population density. Deploying a FTTH network requires a high amount of trenching. As trenching is expensive it can contribute 60% - 70% of the cost per home passed. For deployments based on alternative passive infrastructure such as aerial deployments, costs can be reduced significantly. Figure 4 shows the interaction between density and duct length. The figure represents two streets with different number of buildings (left= 4, right= 10) and thus a different population density. The two streets require the same amount of public trenching (the green horizontal line) but the cost is shared by more users on the right and therefore the cost per home is lower.

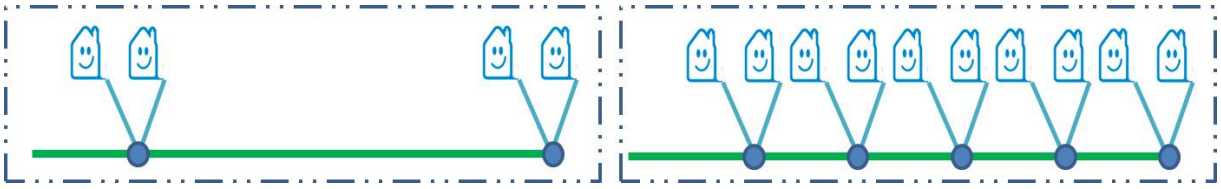

Figure 4: The relationship between population density and cost per home passed

It is important to note that not only population density influences the cost - but density is the simplest relation one can define.

Another geographical parameter that influences the cost is the amount of single dwelling units versus the amount of multi dwelling units in the area.

It is mathematically possible to find all the geographical parameters influencing the cost of a fibre network and to define a cost function containing all these parameters. However, such a model is not possible for the EU28 countries as all those parameters need to be exactly known in order to predict the cost. As will be discussed later, it is already challenging to obtain two simple geographical parameters: the area size and the population. Therefore the model breaks population into nine different categories based on population densities and uses the data from deployments in each category area as a cost proxy.

Trends

Figure 5 shows the 'cost per home' for the 36 sampled areas for varying household density. The total sum of living units (homes) for the new trend lines (adding up the original 355k sample points and the extra sample points).These sample points are then used to calculate a best-fitting curve. The result is of the form $f(x) = cx^b$ or a power-curve.

The 'cost per home' is the following sum:

'Cost per home passed' +50%of 'Cost per home activated'.

This 'cost per home' curve is based on the assumption that:

- all EU28 homes must be passed
- Only half of the homes passed get activated (connected):a 50% adoption.

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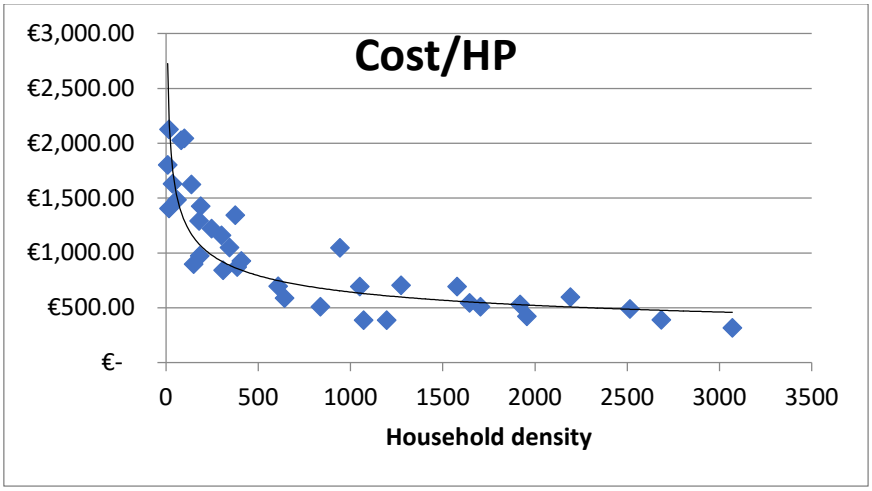
Note: the graphs in figure 5 must be interpreted with great caution and must in no way be used to determine the cost of a single FTTH project.

First of all: this graph does not specify which labour costs are used for the calculation of the sample points. As the pie-charts in figure 6 clearly indicate, labour costs (labour civil + labour install) can be up to 80% of the total cost of the network. Small variations in the labour cost can therefore have a major impact on the total cost.

Secondly, the sample points do have a decreasing 'trend' but do not exactly follow the trend line. The difference can be more than 30%. It is clear that household's density and cost per home have a decreasing trend, but there are other geographical elements that influence the cost.

If the area only consists of single dwelling units, the activation cost will be much higher compared to an area consisting out of large multi dwelling units. Therefore, the sample points not only vary in household density, but also vary in 'building style'. This information is shared in Appendix 1. The sample points have a varying building profile. It is not easy to find average building profiles for countries. This will be improving the accuracy of the modelling when completing country specific models.

As already stated, the model should not be used to predict the exact cost of a single FTTH project. The more sample points used, the more geographical variations are taken into account and the more accurate the average function will be. The curve can be used to predict the accumulated cost of many FTTH projects and the larger the estimate, such as predicting the cost for EU27 countries the more accurate it will be.



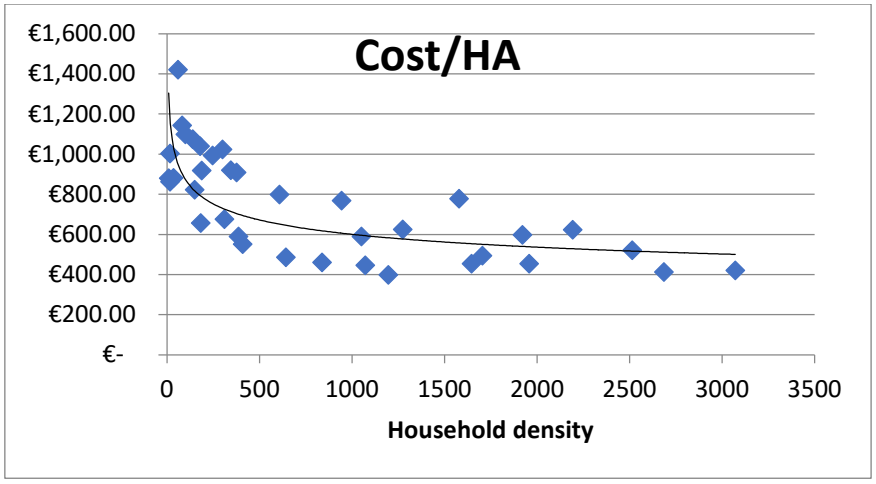


Figure 5: The cost per HP and HA for the 36 sample areas with a varying density

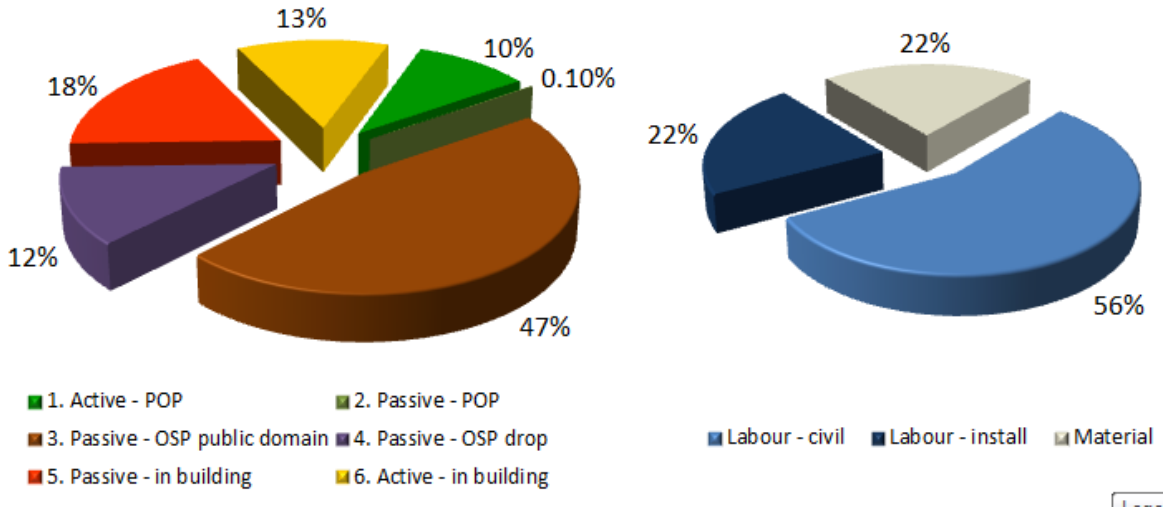


Figure 6: Example of the Home Connected costs (= cost per home passed + cost per home activated) for one of the sample areas – divided into the 6 cost categories of table 15 and for the same area divided into 3 categories labour civil, labour install and material cost.

Areas

The cost-density relation assumes that the cost to deploy a FTTH network in a certain area can be estimated based on the availability in a given areas of the household density and the number of households. This report investigates the cost to deploy FTTH in Europe, or more specifically, the 28 countries that currently form the European Union (EU28 countries). The straightforward (but not correct) way of calculating the total cost of deploying fibre in Europe would be by using the trend line of figure 5. The population and population density of the European Union is known, the number of households and household density can be derived and therefore the total cost can be calculated.

This section will enhance this straightforward calculation to take a number of other factors into account.

Eurostat data

The data used in the following sections originates from Eurostat[1]. Eurostat is the statistical office of the European Union situated in Luxembourg. Its task is to provide the European Union with statistics at European level that enable comparisons between countries and regions

For each section, the name of the file that is used to perform the calculations will be mentioned. However, investigating the data provided by Eurostat, it became clear that the data are not completely error-free. Therefore, each dataset is also verified with other data sources in order to maximise the reliability of the input data.

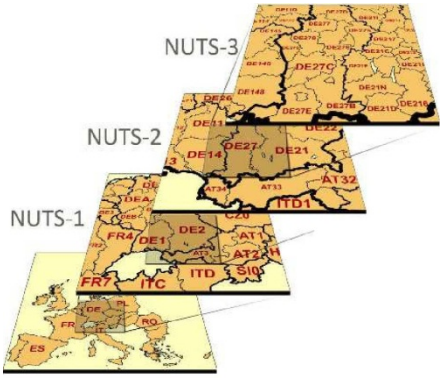


Figure 7 Hierarchical structure

[1] http://epp.eurostat.ec.europa.eu/portal/page/portal/about_eurostat/introduction

NUTS classification

It would be possible to use the general information of the EU27 countries to perform the calculations using the average values, however the more detail that is available the higher the reliability of the calculations. However, there is a trade-off between increasing the reliability and having statistics available for a certain level of detail. Eurostat defines the NUTS classification (Nomenclature of territorial units for statistics), a hierarchical system, see figure 7,for dividing up the economic territory of the EU[2].

The three NUTS levels for the 28 European Union member states regions are:

NUTS 1: major socio-economic regions [98 regions].

NUTS 2: basic regions for the application of regional policies [276 regions].

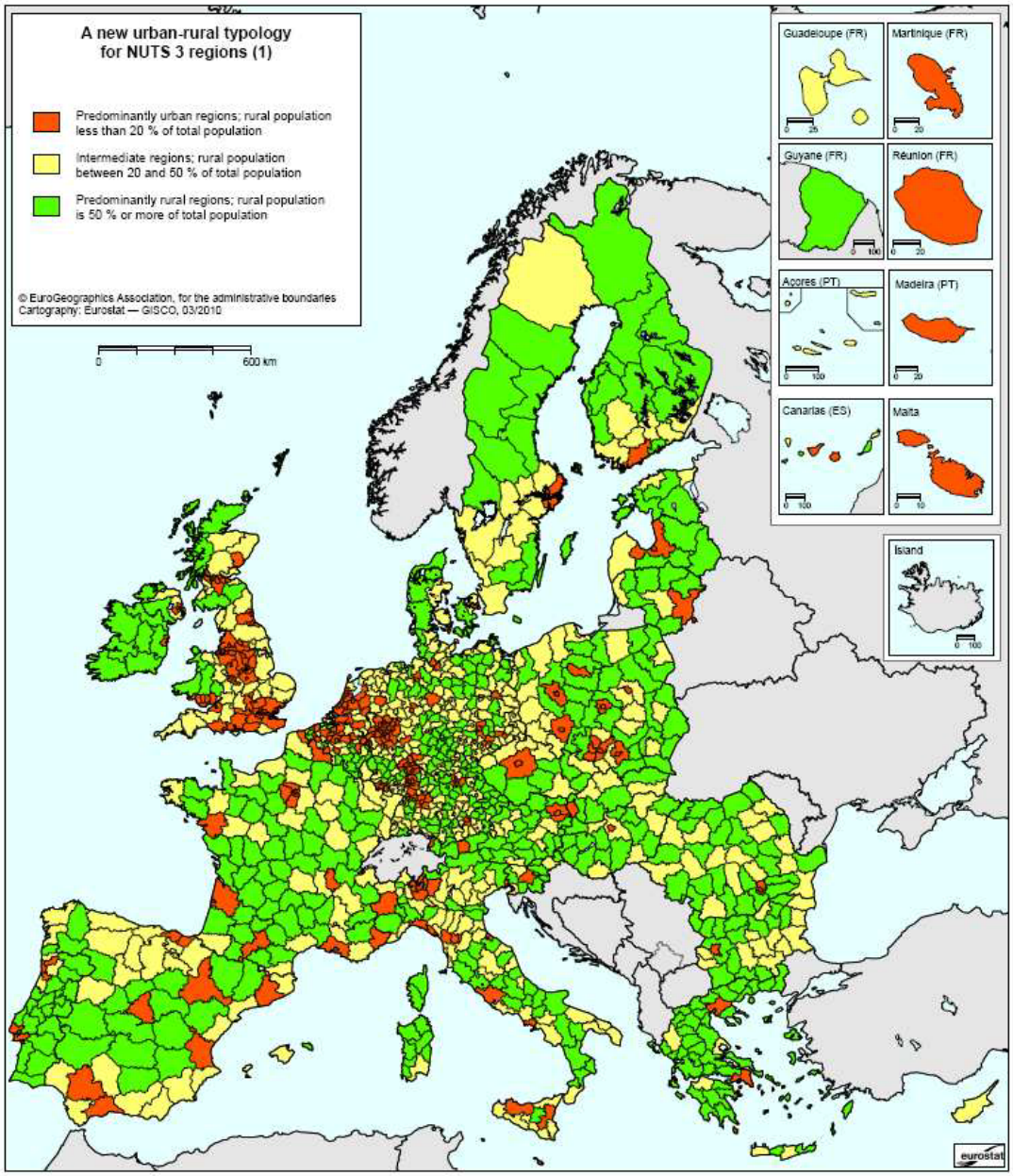
NUTS 3: small regions for specific diagnoses [1342 regions].

The NUTS 3 level is the deepest level for which reliable data is available.

As can be seen in figure 8, these 1342 regions are not homogeneous. The size of these regions varies strongly: in some countries, e.g. The Netherlands, Belgium and Germany, the NUTS 3 areas are small, whereas in Spain or Finland the areas are much bigger. The reliability of the calculations would greatly increase if the model did not use the data of NUTS 3 areas, but rather data on the level of villages. However, as no consistent data is available for this level of detail for the EU28 countries, NUTS 3 is the best alternative addressing all countries[3].

[2]http://ec.europa.eu/eurostat/web/nuts/overview

[3]http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Urban-rural_typology



(1) This typology is based on a definition of urban and rural 1 km² grid cells. Urban grid cells fulfil two conditions: 1) a population density of at least 300 inhabitants per km² and 2) a minimum population of 5 000 inhabitants in contiguous cells above the density threshold. The other cells are considered rural. Thresholds for the typology: 50% and 20% of the regional population in rural grid cells.

For Madeira, Açores and the French outermost regions, the population grid is not available. As a result, this typology uses the OECD classification for these regions.

Figure 8: Map with the 1303 NUTS3 regions

Population, households and Area sizes

Population: Filename: [demo.r.pjanaggrd];

Households: Downloaded file from: [lfst.lihantych];

This file contains the average number of persons per household per EU28 country. For EU28, the average is 2.4 persons per household. The trend line in figure 5 is not based on population density but uses household density. Using the data on the average number of

persons per household, one can derive the number of households per NUTS 3 region from the population data.

Area sizes: Filename: [derno.r _d3area];

This file contains the total area size up to NUTS 3 level. This data can be used to calculate the household density, needed to apply the trend line, for each NUTS 3 region. However, this definition of household density would result in an overestimation of the cost therefore a new definition of household density is proposed and used in the model.

Redefining density

The problem with the current definition of household density (= number of households in NUTS 3 region / area size of NUTS 3 region) is visualized in figure 9. Of the two area sizes defined in the figure - 'populated area surface' and 'total area surface' - two different household densities can be calculated but which one is mathematically correct to be applied on the trend line? As the cost per home decreases for increasing household density, it is obvious that selecting the right density figure is of criticalimportance for extracting reliable estimates.

Figure 10 simplifies the problem by comparing two virtual regions $Area_{left}$and $Area_{right}$. Table 11 summarizes the characteristics of the two areas, assuming that each green box has the following characteristics: number of households = X, area surface = Ykm^2. As already stated before, the largest cost to deploy a FTTH network, is related to trenching.

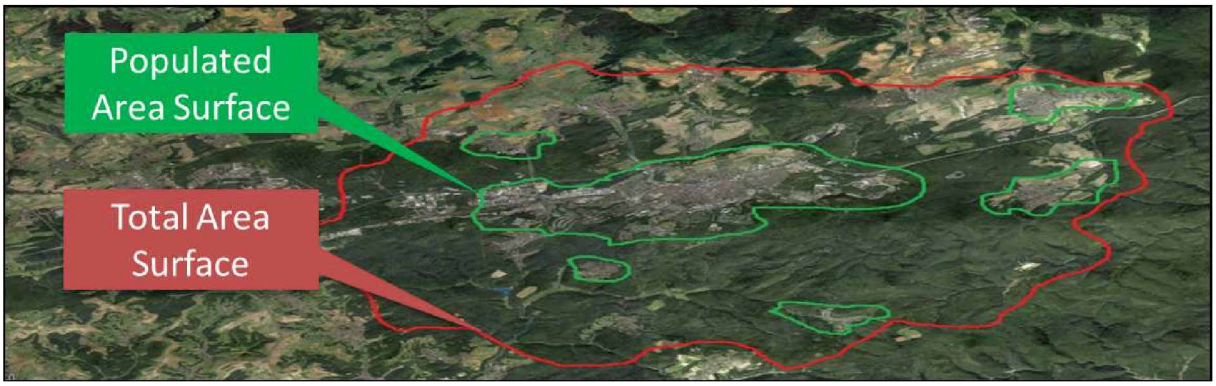


Figure 9: The difference in 'populated area surface' (inner green polygons) and 'total area surface (outer red polygon).

Figure 10: Simplification of the populated area problem, area statistics summarized in table 11.

For the two areas, this amount is roughly the same, as one will only trench in the populated areas. If the amount of households *(X)* would be the amount that one central office could serve, then the cost to deploy a network is the same for the two areas, i.e. 6x the cost of a green box. If *X* is smaller, the difference in cost between the two areas is the amount of ducts and cables needed in the feeder layer. This extra cost is in general rather small compared to the total cost in most cases. As the average number of households in a NUTS 3 region is more than 161.000, multiple central offices are needed in each NUTS 3 region which implies that *X* in many cases will be large enough to justify the approach chosen. This clearly shows that the approximation of density based on the populated area surface (in green) is the best density parameter to consider for our extrapolation model.

Characteristic	$Area_{left}$		$Area_{right}$
Number of households	$6X$		$6X$
Area surface (red)	$6Y$		$12Y$
Area surface (green)	$6Y$		$6Y$
Household density (red)	$\frac{X}{Y}$	$>$	$\frac{X}{2Y}$
Household density (green)	$\frac{X}{Y}$	$\approx$	$\frac{X}{Y}$

Table 11: Two household densities can be calculated: (red) and (green).

Land Use overview

The redefinition of household density will only be more exact if data are available from which the populated area surface can be derived. This data can be extracted from the LUCAS project.

The Land use/cover area frame survey (LUCAS) project is initially developed to deliver, on a yearly basis, European crop estimates for the European Commission. With time, the survey has become essential in providing policymakers and statisticians alike with increasing

amounts of data on different forms of land use in Europe and proved to be a useful tool in the area of environmental monitoring[4].

The LUCAS project contains two datasets: 'land use' and 'land cover'. The 'land use' dataset is used to derive 'populated area surface' from 'area surface'. The land use data divides each NUTS 2 area surface size in the following 6 different land uses:

1. Agriculture
2. Forestry
3. Hunting and Fishing
4. Heavy Environmental Impact
5. Services and Residential
6. No Visible Use

To calculate the 'populated area surface', it is possible to only include the land use 'Services and Residential'. This land use however is too small; people live in the other categories as well. For example, a lot of farmers will live in the land use 'Agriculture', but it is clear that taking into account this land use for all regions would also add all the agricultural fields - which is not desired.

Therefore, the following definition of populated area surface is applied:

Populated area surface = 'Heavy Environmental Impact' + 'Services and Residential'.

This choice is verified on some regions, using satellite pictures. It showed that 'Heavy Environmental Impact' can be related to both industry and large living blocks (MDU's). This land use is included completely in the populated area surface in order to be on the safe side concerning the reduction of 'total area surface' to the 'populated area surface'.

The land use data categorizes only NUTS 2 levels, while the more detailed data of NUTS 3 level are needed. Straightforward application of this land use percentage of NUTS 2 on each NUTS 3 level within the NUTS 2 region results in incorrect population densities. Therefore a 'rule based' correction is designed. Please refer to Appendix 2.

[4] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/LUCAS_%E2%80%94_a_multi-purpose_land_use_survey