Chapter 5. Applying existing methods to countries without established functional areas

This chapter uses the method for delineating functional areas explained and discussed in Chapter 4. It applies the method in five OECD countries that so far have no fully established functional area geography for their entire national territory. The chapter presents the application results for each country. Additionally, the chapter illustrates how non-traditional data sources such as mobile phone data can help identify functional linkages between different areas.

Several OECD countries have not yet developed a comprehensive definition of functional areas for their entire territory. This chapter applies existing methods for delineating functional areas, presented in Chapter 4, to the following five OECD member countries for illustrative and research purposes: Canada, Estonia, Korea, Mexico and the United States. In pursuing this exercise, the report does not aim to create or impose new statistical conventions but rather tries to illustrate the methodology application. Canada was chosen due to Statistics Canada's ongoing work to define functional areas. The United States was picked for comparative reasons (similar geography and geographic challenges to Canada) and research purposes. The analysis includes Korea and Mexico, as both are populous OECD countries that so far have not established functional area geographies for their entire national territories. Estonia is part of the application exercise to demonstrate how unconventional data sources, in this case, mobile phone data, can provide the necessary information to delineate functional areas.

There are two maps available for each country. The first map presents the results of the exercise taking into account all geographic units in the country. The second map excludes the geographic units that also form part of a functional urban area (FUA). The libraries used to create the functional areas are Python's self-contained labour areas (SLAs) for Canada and the United States and R's LabourMarketAreas for all other countries.

Table 5.1 provides an overview of the application results in the five countries considered. It reports the number of identified functional areas, their average size in terms of incorporated administrative units and their average population size. Additionally, it specifies the parameter values in terms of population size and self-containment that yielded the estimation results. Furthermore, the table shows how those summary statistics change if FUAs are excluded and the delineation of functional areas thus only covers the remaining territory.

Table 5.1. Summary of results

Scenario	*Wmin* (000s)	*Wtarget* (000s)	*SCmin*- (%)	*SCtarget*- (%)	Number of areas	Avg. units per cluster	Avg. population	FUA included
Estonia	10	20	70	95	17	50	82 214	No
Estonia	10	20	70	95	16	53	87 353	Yes
Korea	100	300	70	95	48	5	897 811	No
Korea	100	300	75	90	36	6	1 197 083	Yes
Mexico	50	100	75	90	228	11	555 635	No
Mexico	50	100	75	90	186	13	681 102	Yes
United States	0	25	70	95	882	4	370 000	No
United States	0	25	70	95	762	4	426 900	Yes
Canada	0	15	75	90	440	8	12 300	No
Canada	0	15	75	90	337	10	103 800	Yes

Note: The table above provides summary statistics of the delineation of functional areas for selected OECD member and OECD accession countries. W_{min} and W_{target} denote the minimum and target number of employees in the area respectively. SC_{min} and SC_{target} denote the minimum and target levels of self-containment respectively. The column FUA indicates if statistical areas were included in the exercise. Size refers to population size of the functional areas.

Canada

Statistics Canada developed the geography of SLAs that covers all Canadian municipalities using commuting data. Each SLA consists of a self-contained grouping of areas where the majority of residents both work and live.

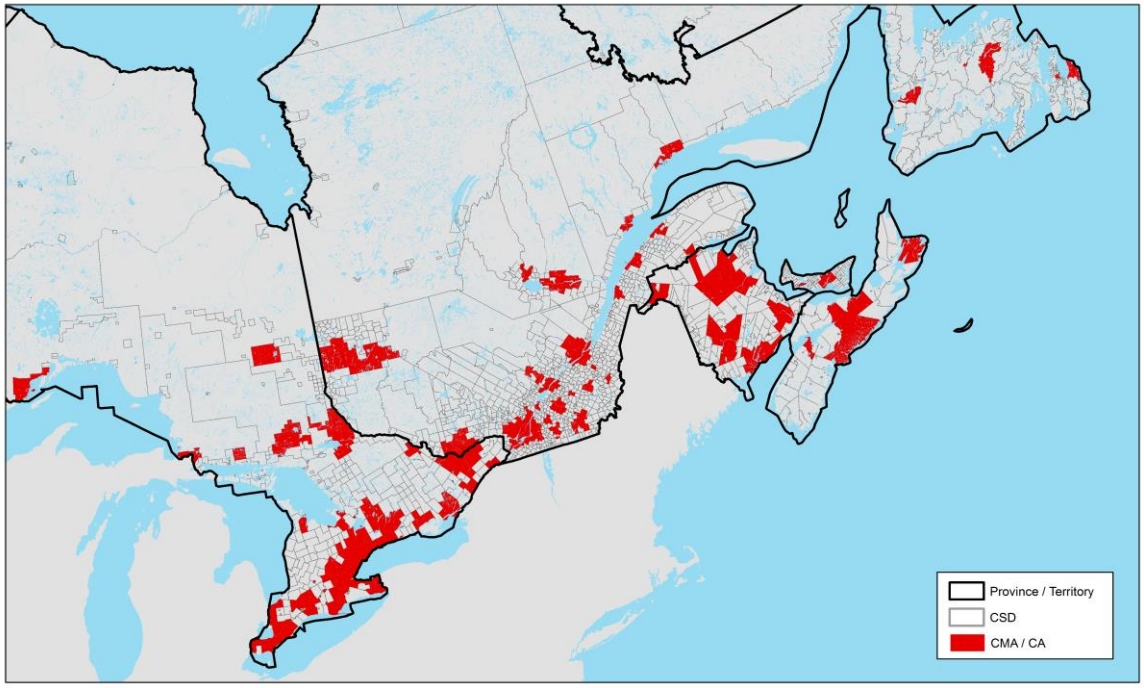
The SLAs use census subdivision (CSD) data from the 2006 Census of Population and the 2011 National Household Survey as building blocks. Currently, Statistics Canada is updating the SLA geography based on the 2016 Census of Population data. CSDs in Canada are heterogeneous in size and population.

A key question in the process to create SLAs is the integration of the functional area methods with the existing Census Metropolitan Area/Census Agglomeration (CMA/CA) geography. Consequently, three main options were explored to delineate functional areas for the entire territory. The first maintains the parameters for the SLA geography without consideration of the CMA/CA areas. The second examines potential adjustments to the choice of the parameters in the SLA method to achieve better alignment with CMAs/CAs. The final option delineating SLAs while only using commuting flows between non-CMA/CA areas.

Statistics Canada determined that the best option appeared to be redoing the SLA geography while only including commuting flows among non-CMA/CA areas. This option has two major advantages: it offers an alignment between SLAs and CMAs/CAs and it nonetheless provides useful information on areas outside CMAs/CAs that constitute meaningful non-urban or rural labour markets. However, the option of starting with the "fixed" FUAs (CMAs/CAs) and then only running a multi-directional analysis on the remaining areas might also create some problems. For example, Figure 5.2 shows some isolated small areas outside the FUAs in southern Ontario.

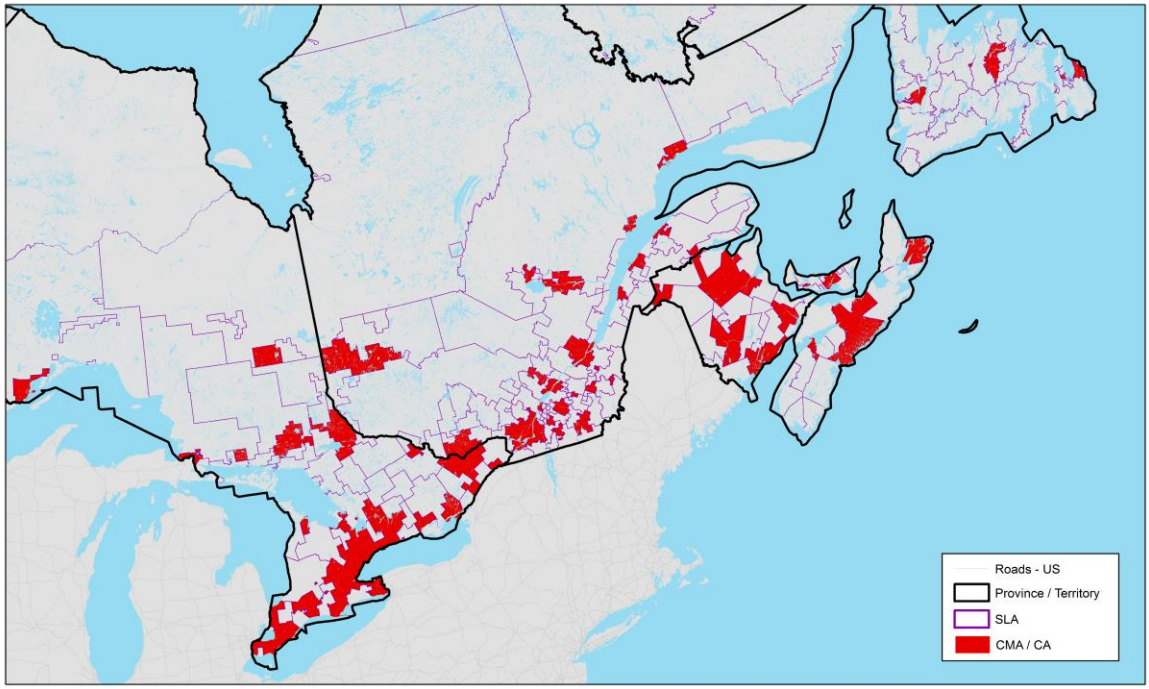
Figure 5.1 presents the territory containing CMAs/CAs before delineating SLAs for Eastern Canada. Figure 5.2 presents the SLAs developed using the methodology. The figures provide insights into how SLAs outside CMAs/CAs form and which census subdivisions make up the respective cluster.

Figure 5.1. 2016 Census metropolitan areas (CMAs), 2016 census agglomerations (CAs) and 2016 census subdivisions (CSDs), Eastern Canada



Source: Statistics Canada, 2019.

Figure 5.2. 2016 Census metropolitan areas (CMAs), 2016 census agglomerations (CAs) and self-contained labour areas (SLAs), Eastern Canada



Source: Statistics Canada, 2019.

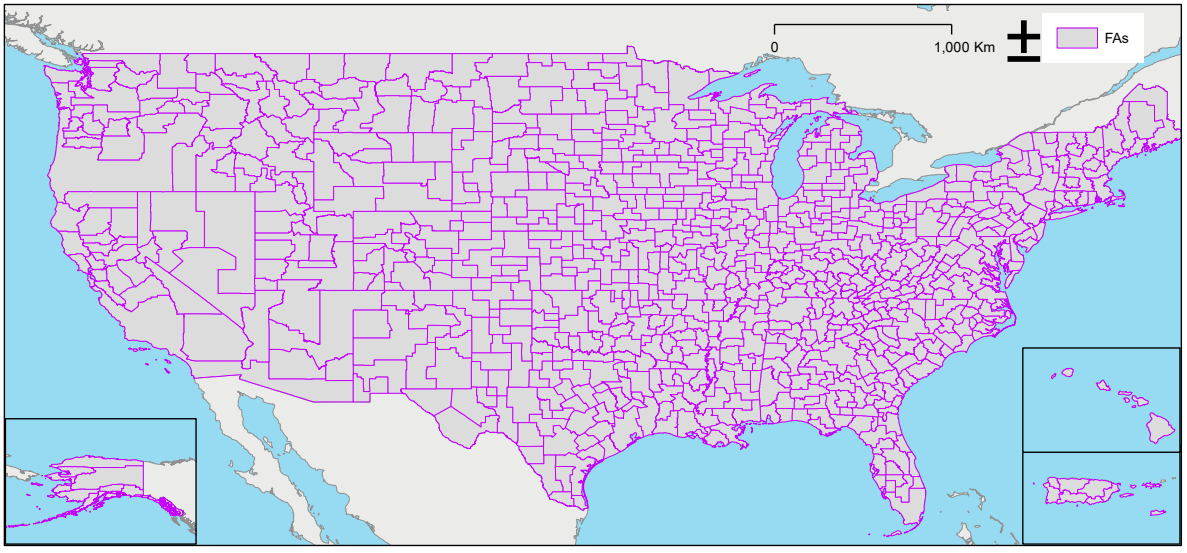
United States

For the purposes of research and comparison to Canadian areas, the methodology was applied to the United States. The building blocks to create functional areas (FAs) in the United States are the counties. The United States has 3 220 counties with an average number of employees of 45 000. The data for the United States come from the five-year (2011-15) American Community Survey Commuting Flows.

Counties in the United States are heterogeneous in size and population. The population in counties range from a few thousand up to around 10 million people and are not equally distributed.[1]

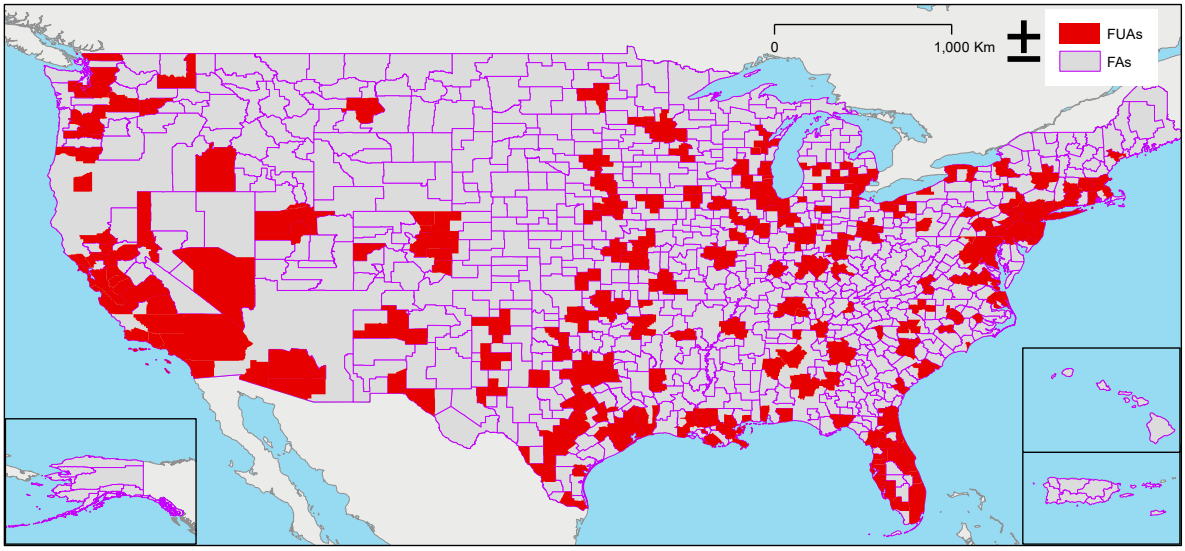
Figure 5.3 presents the estimated functional areas for all counties in the United States using the following parameters: SC_{min} 70%, SC_{target} 95%, W_{min} *0,* W_{target} *25 000*. Figure 5.4 shows the estimated functional areas excluding the counties that belong to a functional urban area.

Figure 5.3. Functional areas (FAs) in the United States



Note: The figure above presents the estimated functional areas for the United States using the following parameters: SC_{min} 70%, SC_{target} 95%, W_{min} *0,* W_{target} *25 000.*
Source: Statistics Canada calculations.

Figure 5.4. Functional areas (FAs) and functional urban areas (FUAs) in the United States



Note: The figure above presents the estimated functional areas for the United States using the following parameters: SC_{min} 70%, SC_{target} 95%, W_{min} *0,* W_{target} *25 000.*
Source: Statistics Canada calculations.

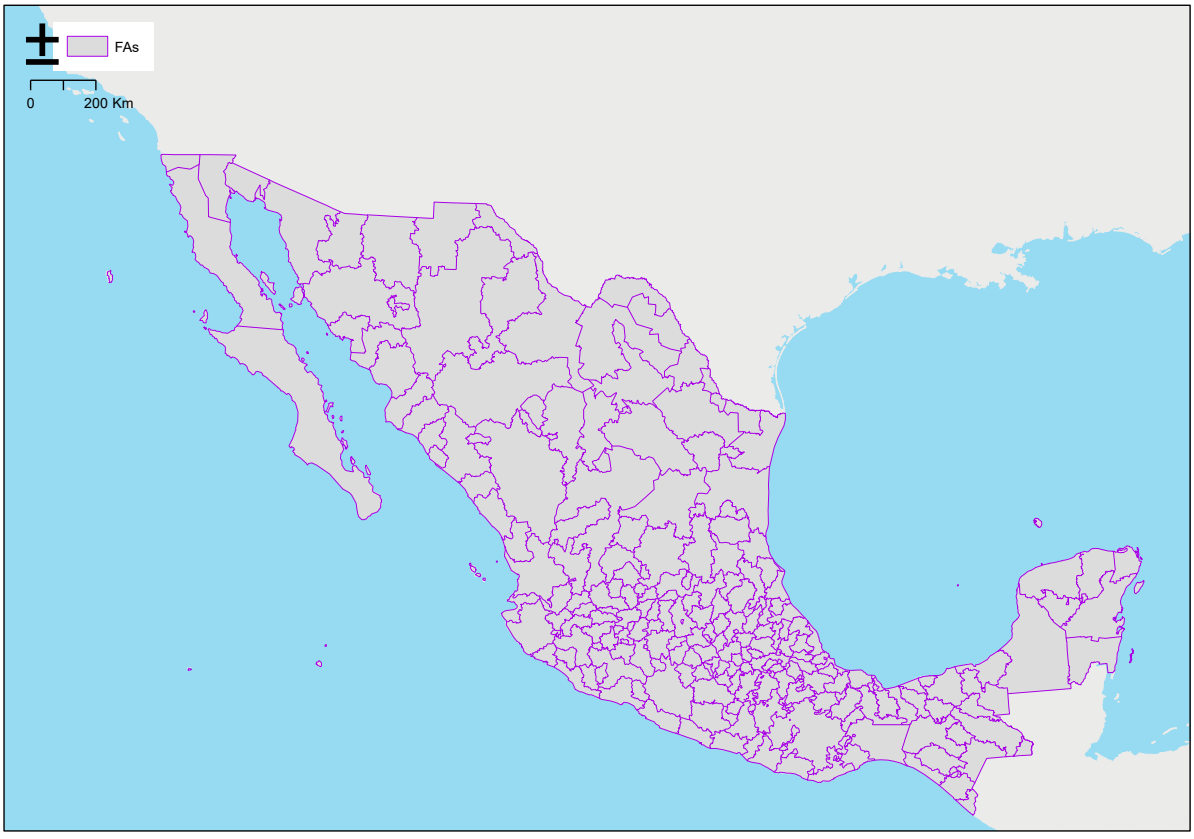
Mexico

The building blocks to create functional areas (FAs) in Mexico are the municipalities. Mexico has 2 446 municipalities (2015) with an average number of employees of approximately 18 000. The commuting flow data come from the 2015 census.

Municipalities in Mexico are heterogeneous in size and population. Municipalities in the northern part of the country tend to be bigger in size than municipalities in the middle of the country. Furthermore, some municipalities such as Ensenada encompass an entire TL3 region, the second-largest administrative division of the country.

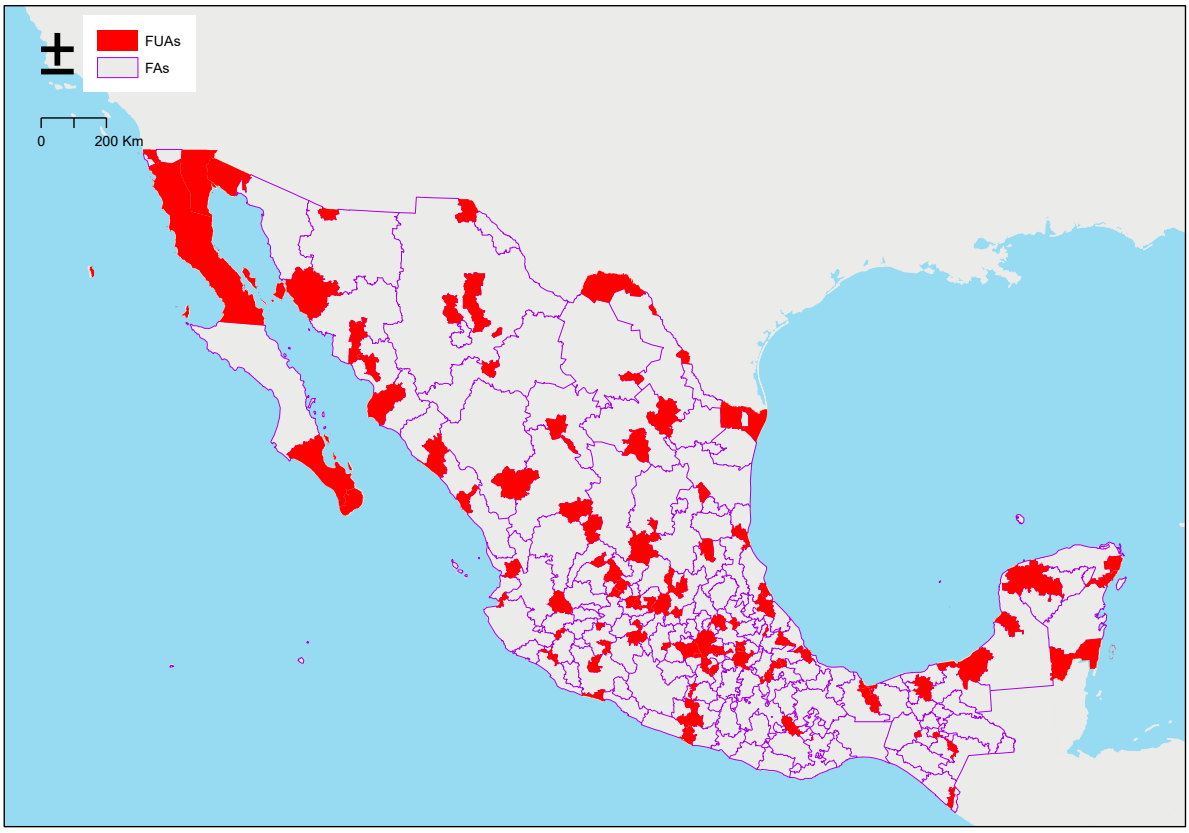
Figure 5.5 presents the estimated functional areas for all municipalities in Mexico using the following parameters: SC_{min} 75%, SC_{target} 90%, W_{min} *50 000,* W_{target} *100 000*. Figure 5.6 shows the estimated functional areas excluding the municipalities that belong to a functional urban area.

Figure 5.5. Functional areas (FAs) in Mexico



Note: The figure above presents the estimated functional areas for Mexico using the following parameters: SC_{min} 75%, SC_{target} 90%, W_{min} *50 000,* W_{target} *100 000*. Results shown are post-processing.
Source: OECD calculations.

Figure 5.6. Functional areas (FAs) and functional urban areas (FUAs) in Mexico



Note: The figure above presents the estimated functional areas for Mexico using the following parameters: SC_{min} 75%, SC_{target} 90%, W_{min} *50 000,* W_{target} *100 000*. Results shown are post-processing.
Source: OECD calculations.

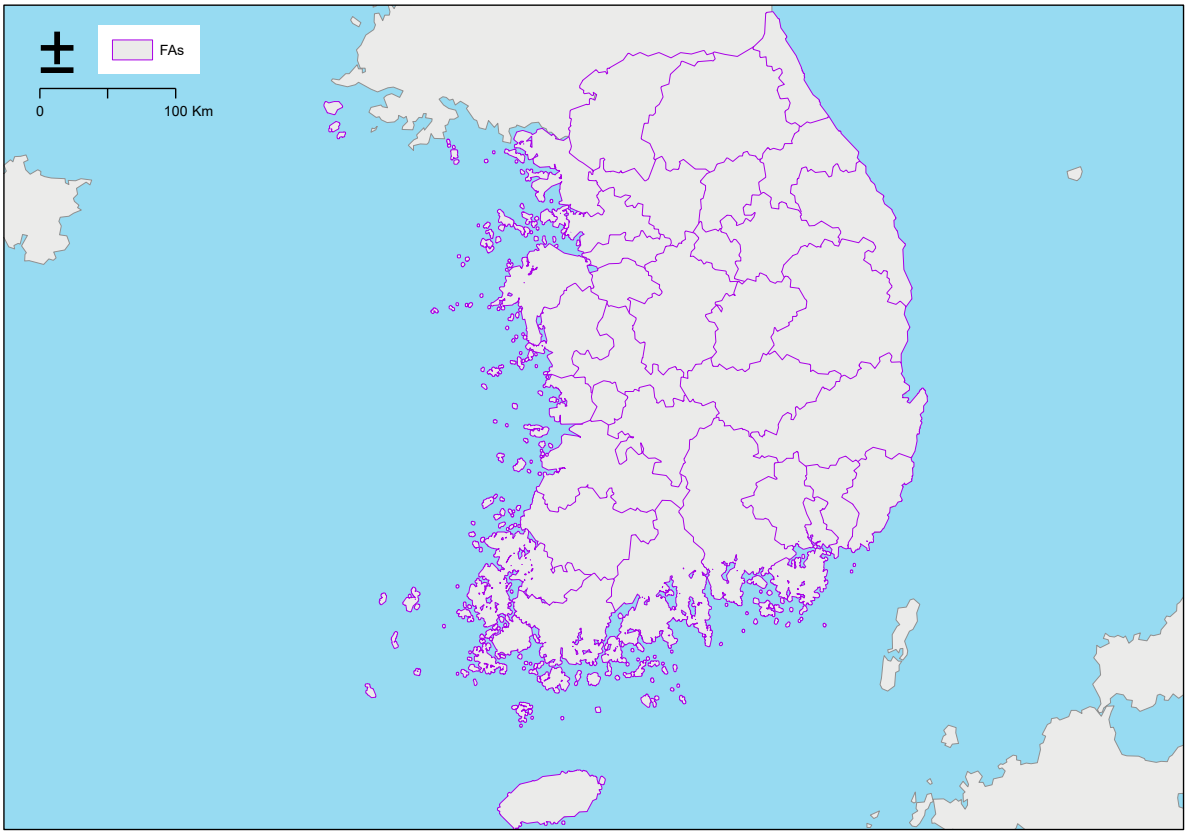
Korea

The building block to create functional areas (FAs) in Korea are the municipalities. There are a total of 227 municipalities (2015) with an average of approximately 130 000 employees. The commuting flow data come from the population census and was provided by Statistics Korea.

Municipalities in Korea are larger in population and density than the geographic units for other countries examined in this report. To account for these differences, the parameters W_{min} and W_{target} have a higher threshold.

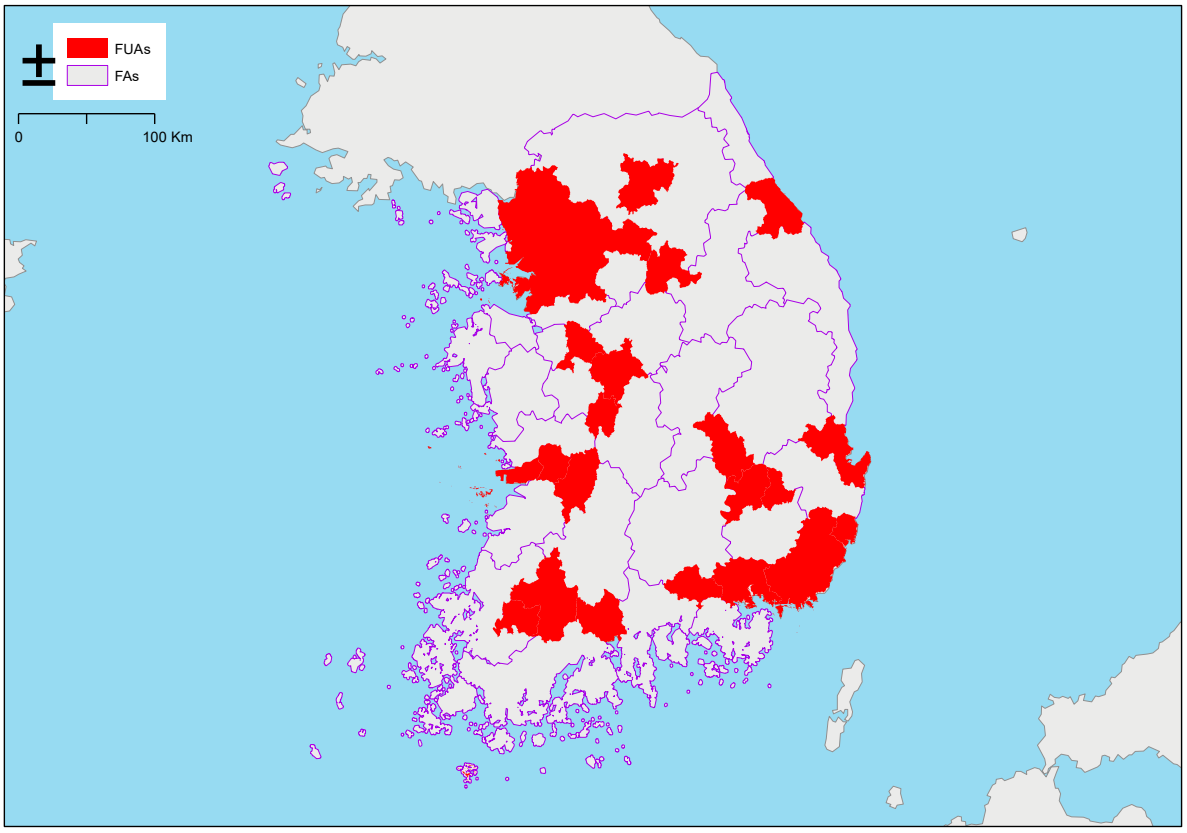
Figure 5.7 presents the estimated functional areas for all municipalities in Korea using the following parameters: SC_{min} 75%, SC_{target} 90%, W_{min} *100 000*, W_{target} *300 000*. Figure 5.8 presents the estimated functional areas excluding the municipalities that belong to a functional urban area. Similar to the case of Canada, excluding FUAs from the delineation of functional areas might yield some problems. For instance, in Korea, that second approach shows a "donut" functional area defined around Chuncheon (Figure 5.8).

Figure 5.7. Functional areas (FAs) in Korea



Note: The figure above presents the estimated functional areas for Korea using the following parameters: SC_{min} 75%, SC_{target} 90%, W_{min} *100 000*, W_{target} *300 000*. Results shown are post-processing.
Source: OECD calculations.

Figure 5.8. Functional areas (FAs) and functional urban areas (FUAs) in Korea



Note: The figure above presents the estimated functional areas for Korea using the following parameters: SC_{min} 75%, SC_{target} 90%, W_{min} *100 000*, W_{target} *300 000*. Results shown are post-processing.
Source: OECD calculations.

Estonia

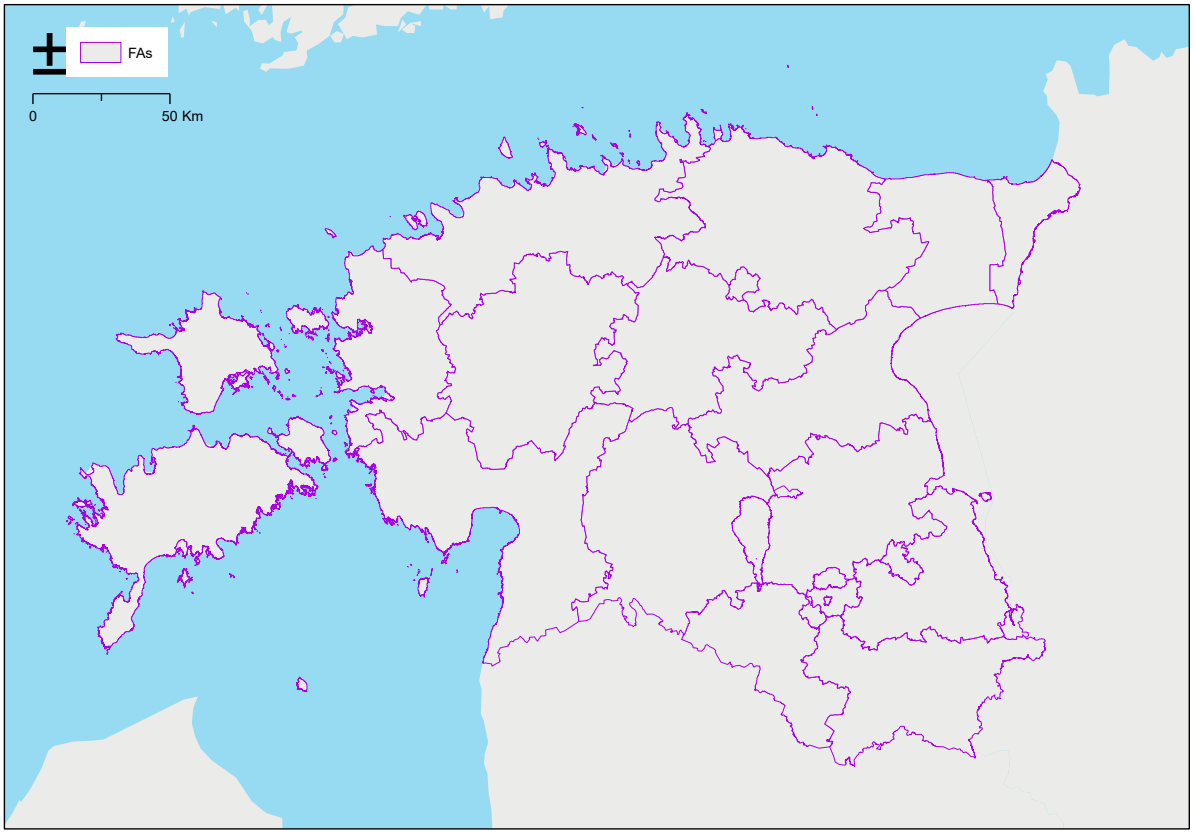
The building blocks to create functional areas (FAs) in Estonia are the territorial communities. There are a total of 847 territorial communities across the country with an average population of approximately 1 650 inhabitants.

The commuting flow data are derived from mobile positioning data, provided by Aasa (2019[1]). In contrast to other data sources examined, the data for Estonia provide estimates of commuting flows for the entire population (not only employees) at a highly disaggregated level.

The pre-processed results in Estonia contained several non-contiguous and disjoint functional areas. This may be due to the low population of some geographic units, the interconnectivity of geographic areas and the small size of the country. The post-processing algorithms re-assigned isolated and disjoint functional areas following the methodological guidelines discussed in Chapter 5.

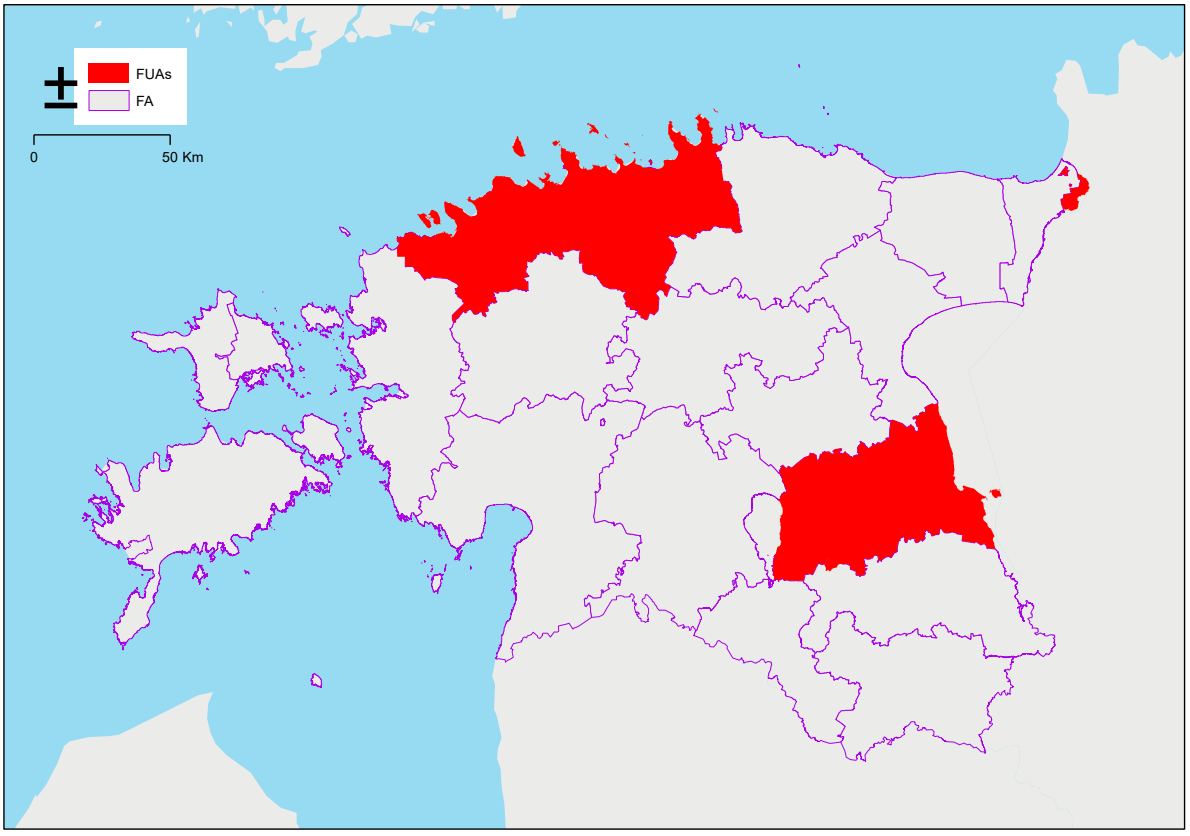
Figure 5.9 presents the estimated functional areas for all territorial communities in Estonia using the following parameters: SC_{min} 70%, SC_{target} 95%, W_{min} *10 000,* W_{target} *20 000*. Figure 5.10 presents the estimated functional areas excluding the territorial communities that belong to a functional urban area.

Figure 5.9. Functional areas (FA) in Estonia



Note: The figure above presents the estimated functional areas for Estonia using the following parameters: SC_{min} 70%, SC_{target} 95%, W_{min} *10 000,* W_{target} *20 000*. Results shown are post-processing.
Source: OECD calculations.

Figure 5.10. Functional areas (FA) and functional urban areas (FUAs) in Estonia



Note: The figure above presents the estimated functional areas for Estonia using the following parameters: SC_{min} 70%, SC_{target} 95%, W_{min} *10 000,* W_{target} *20 000*. Results shown are post-processing.
Source: OECD calculations.

Note

[1] Population data stem from JRC (2019[2]).

References

Aasa, A. (2019), *OD-matrices of Daily Regular Movements in Estonia (Dataset)*, Mobility Lab, University of Tartu, https://doi.org/10.23659/UTMOBLAB-1. [1]

JRC (2019), *GHSL - Global Human Settlement Layer*, https://ghsl.jrc.ec.europa.eu/. [2]