

Title: Travel modes, GHG emissions and spatial distribution of daily travel in the Capital Region

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The presentation includes an analysis of greenhouse gas (GHG) emissions from local, national and international travel, the share of travel modes utilized for local travel and the spatial distribution of visited destinations within the greater Reykjavík area. It introduces a typology of travel-related urban zones in the region calculated based on population density, the density of commercial and office functions and access to public transportation, following a method developed in Helsinki and Stockholm. The results are compared to similar data from the Helsinki Metropolitan Area. The data were collected in October 2017 with an online map-based survey, completed by 780 young adults (aged 25 to 40) residing in the capital region.

Private car is by far the most commonly used travel mode by young adults in the greater Reykjavík area. Among the participants, 67% choose a car as a primary travel mode for commuting, 15% chose to walk, 9% go by bicycle and 9% by bus. The results differ when the percentage of travel modes by each trip is calculated, as many respondents reported a secondary mode of travel. For commuting, the percentage of trips in a year taken by car were 50%, 17% by bus, 20% by foot and 13% bicycle. To other places such as leisure and shopping, the percentages were 48%, 6%, 33%, and 13%, respectively. These results show that when visiting voluntary locations rather than commuting, respondents were more likely to walk and less likely to take the bus. Although similar patterns can be found in data from Helsinki Metropolitan Area, its residents do not depend as much on the use of a private vehicle; only 25% of trips to work or study places and 21% of other trips were taken by car.

Calculating the travel-related urban zones in the Reykjavík Capital Region highlighted the differences between the region and its Finnish counterpart. The typology was based on population density, commercial density and access to public transportation. Compared to Helsinki, Reykjavík has poorer access to public transportation. The sub-centers, which include a high number of residents and jobs within a walking distance from well-connected public transportation hubs, do not have their direct counterpart in Reykjavík. We have identified 7 candidate sub-centers: Hafnarfjörður, Smáralind, Hamraborg, Mjódd, Ártún, Árbær, and Mosfellsbær. Compared to the sub-centers in Helsinki Metropolitan Area, the surroundings of these locations are often not pedestrian-friendly and the functions are not mixed.

The urban zones are related to travel patterns of their residents. Among those who live in the central pedestrian zone (i.e. within 1500 m from the city center), 35% choose walking as a primary commuting travel mode, 40% drive a private car and 14% cycle. The GHG emissions from their local travel are the lowest among the Reykjavík residents at ca. 500kg CO<sub>2</sub>e per year per person, but twice as high as those of the Helsinki downtown residents (ca. 230kg CO<sub>2</sub>). Among those who live in the fringe of the pedestrian zone (between 1500 and 3000 m from the center), 57% commute by car, 19% on foot, 13% by bicycle, and 11% by bus. Their emissions from local travel are estimated at 820kg CO<sub>2</sub> per person per year. Residents of the zones further away from the center predominantly use cars (75-79%) and rarely use public transportation. There are only very small differences related to bus stop accessibility: 10% of bus commuting in the zone with the best access to public transportation, and 6% in the other zones. The average emissions in the zones with access to public transportation are estimated at ca. 1100kg CO<sub>2</sub>, and in the car-oriented zone at 1400kg CO<sub>2</sub>.

When the emissions from international travel are considered, they outweigh the emissions from local travel, averaging at 2800kg CO<sub>2</sub> per year. Interestingly, the residents of the central pedestrian zone have the highest emissions from international flights (ca. 3570kg CO<sub>2</sub> per person per year). As a result, the total travel-related emissions are similar across the region.

The recently introduced climate action plan for Iceland mentions a transition from fossil fuel-driven private vehicles to electric. Although such measures are an important step to mitigating GHG emissions from daily transport, other consequences of car-dependency will still remain unaddressed. Manufacturing and import of vehicles currently account for about 1/3 of the emissions from car travel in our sample. The total travel-related GHG emissions will still remain high, especially as the number of international flights is predicted to grow in the future. Furthermore, a car-oriented city leaves the issue of service accessibility unaddressed. Our analysis shows that many of the activities are concentrated in the downtown area, and a large number of residents do not have access to important destinations within a walkable distance from their homes.

In summary, the preliminary results of our project highlight the high level of car-dependency among the young residents of the region, which is only partially remedied by a good accessibility of jobs and services in the city center, and is largely unaffected by the public transportation system.