

The Litter Survey in Sweden

Tema 1: Udvikling i statistikkerne

Abstract

The littering in Swedish cities is assumed to have increased the last years, but there have been no scientific method available to disprove or confirm this thesis. In 2007 Statistics Sweden were given the commission by *The Keep Sweden Tidy Foundation*, to develop a method for measuring the littering in central city areas.

The survey process begins with a delimitation of the area by the municipality office. Statistics Sweden then draw a sample of road-parts. For every sampled section of a road the litter is counted on both sides of the road. The field staff, mostly students on summer vacation, count cigarette butts, chewing gum, snuff, pieces of glass etc. The figures are then estimated to population level and published in a report.

Statistics Sweden has also developed a method for measuring litter in green areas and parks.

Aim with the study

The Litter Survey aim to measure the littering on pavements, where pavements are defined as *an area of asphalt, cobbles or concrete located adjacent next to a road*. The pavement is demarcated by the kerb and an obstruction. The obstruction is e.g. a house wall, shrubbery, flower border or high grown grass. The obstructions are permanent and reach the ground, i.e. cars, cycle stands and signposts are no obstructions.

The result of the survey is published in a report with a section for each municipality. In 2008 there were three municipalities, in 2009 eight, and in 2010 we have been measuring litter in nine cities in Sweden.

The method

- One of the spatial data sets is the National Road Database (NVDB) with road/street centre-line from Swedish Road Administration.
- Currently used for sampling for observation plots in the *Litter Survey*.
- The information from the Road Database is combined with definition of central city core from the municipality.

- **Target population:**
 - Pavements in the central city
- **Frame population:**
 - The frame is based upon the road net (line objects) from National Road Data Base (NVDB). Objects in the frame population are spots every fifth metre along the line objects from the National Road Data Base.
- **Sample design:**
 - Stratified systematic sample. The stratification is decided by the municipality. Within each strata, central city area, is a systematic sample drawn.

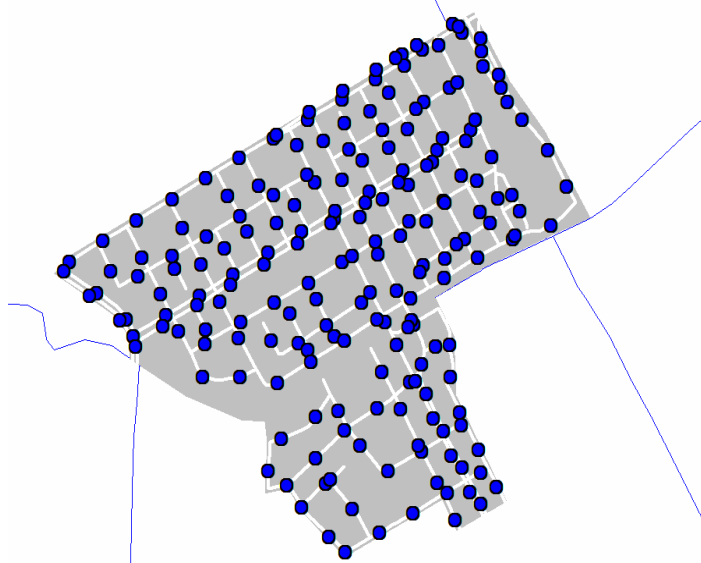
Sample and data collection

A stratified systematic sample 200 sample points is taken and 200 sample points within the central city. Each sample point is a five metre long section of the pavement of varying width.

The coordinates are drawn systematically, and therefore it is optimal to first sort the sample points and then investigate them in order. We start with sample point 1, then sample point 2, and so forth, even if sample point 34 is located near sample point 1. In this way we avoid systematically biased effects of weather and street-cleaning.

The recommended length of the observation period is two to four weeks in order to cover variation in weather and other possible conditions.

Figure 1. Sample points in central city.



Equipment and finding the sample points

Besides measuring tape, paper and a pen, the examiners needs a map and a GPS-receiver. The coordinates of where the sample points are located are accessible on a web page with links to satellite images over the area. If the coordinates point at a spot located alongside pavements, the pavement nearest the spot is chosen for measuring.

To find the spot to be measured is in practice a matter of judgement. The satellite images are not that detailed, so it is crucial that the examiners do not deliberately avoid or look for litter. The direction of the pavement to be measured is chosen in turn; north, east, south, and west.

If the road has two pavements, both sides are measured. Each section of the pavement is divided into ten parts and the area is measured. When one of the examiners measure the width, the other (or others) count the occurrence of litter in that area. The maximum width of a pavement is set to five metres.

All kind of litter is registered and classified according to a list in the field. Thereafter the results are transmitted to the data base via a web page, maintained by Statistics Sweden.

How to interpret the results

Even if we estimate the average number of, e.g. cigarette butts, per area unit for each central city area in the survey, it is not that straightforward to compare the results between the cities. The criteria for which areas that are to be chosen are not given in the design plan, but decided upon by representatives from each city. For that reason the results are not comparable. The strength lies in the future, i.e. in time series of comparable estimates from year to year.

Communicating the result to the public

The results are published by *The Keep Sweden Tidy Foundation* in cooperation with Statistics Sweden for statistical and methodological advices.

In the information sheet we present the five categories with most number of litter items found. We also provide a table where the litter found is categorised by the days in the week (Monday to Friday).