**Estimating the Residential Accommodation Component in a Growing Tourism Market**

**– New landscape, new methods**

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**Abstract**

*The rapid growth in the number of foreign visitors in Iceland has had a profound effect on the Icelandic economy over the last decade. Rapid growth beyond supply in classical accommodation has led to a marked increase in residential accommodation offered through web based sharing platform solutions, either with payment (e.g. Airbnb), or without payment (house swapping sites). There has also been a noticeable increase in camping out in tents and rented camper vans outside official campsites.*

*In response,* *Statistics Iceland began to think about ways to produce statistics for overnight stays in private residential accommodation and on the amount of unpaid indoor and outdoor overnight stays of foreign tourists. Statistics Iceland addressed this with a three-pronged approach where web scraping, information on Value Added Tax (VAT) and Border Survey results were compared, resulting in a combined approach to estimate the number of alternative overnight stays.*

*Since April 2018, Statistics Iceland has produced monthly statistics on alternative methods of accommodation (i.e. residential accommodation and unpaid indoor and outdoor overnight stays), based on the results of a border survey, using VAT turnover numbers for quality control and results from web scraping for production of regional statistics on overnight stays in residential accommodation. In the short time since its introduction, it has led to better informed coverage in discussions of the national economy.*

**Keywords:** Tourism, overnight stays, surveys, VAT, web scraping

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**1. Introduction**

In June 1984, Statistics Iceland started regular collection of data on the capacity of accommodation establishments in Iceland as well as data on overnight stays. The data collection covers all types of accommodation establishments with the exception of trade-union summer houses. In 1995, the collection of data on arrivals at accommodation establishments started, so from that year, data on average length of stay is available.

The main purpose of the data collection is to gather information on tourism as an industry. The data is used for organisation of particular tourism areas, organisation within municipalities, market research, and calculation of gross income of tourism, to name a few applications.

The rapid growth in the number of foreign visitors in Iceland has changed the Icelandic economy significantly over the past few years. The number of departures of foreign passengers through Keflavík International Airport grew from 0.54 million in 2011 to 2.3 million in 2018 (Statistics Iceland, 2019a). Between 2016 and 2018, the total turnover in activities related to tourism grew from 596 billion Icelandic króna (ISK) in 2016 to 678 billion in 2018, or by 14% (Statistics Iceland, 2019b).

Due to the rapid growth beyond supply in classical accommodation from 2011 onwards, residential accommodation became increasingly offered through simple solutions such as Airbnb, along with a car rental market for simple campers/cargo vans accommodating 2-6 persons. With most camping sites closed during the off season over the winter months, there were news of local residents noticing people sleeping in campers and cars in rural areas where traditional campsites were not on offer.

In the national media, there were wide ranging discussions debating the size and effect of these changes. These discussions were hampered by a lack of information and, in some cases, unsubstantiated claims were made based on insufficient data or dubious extrapolations. In light of this, it was decided to produce statistics for overnight stays in residential accommodation (as well as in camper vans, trailers and tents outside of traditional campsites), in order to get a fuller picture of overnight stays of visitors in Iceland. It was clear that additional supporting data would be needed to further develop accurate statistics on all alternative accommodations. The following 3 tasks were set up:

1. Include questions on overnight stays and accommodation in the border survey at Keflavik airport in order to produce statistics on all alternative accommodation.
2. Look into the possibility of gaining information on the VAT turnover of accommodation brokered through Airbnb.
3. Investigate if there were any other possible data sources on Airbnb and other alternative accommodation available, e.g. through web scraping methods.

Preparations for producing statistics for all alternative accommodation and to add that into statistics on classic accommodation started in early 2017.

This paper discusses the tasks Statistics Iceland took to produce the statistics on accommodation and overnight stays, in supplement of the frame of the accommodation statistics produced in line with EU regulation.

**2. Methods**

*2.1. STATICES’s Accommodation Database*

At Statistics Iceland, accommodation statistics and overnight stays in all types of registered accommodation are produced in line with EU regulation. Information on active establishments is received from the Icelandic Tourist Board, representatives of regional bureaus for the promotion of tourism, The National Commissioner of the Icelandic Police as well as from various tourist related brochures and media coverage. Everyone who sells accommodation is obliged by law to send Statistics Iceland reports monthly, with information on capacity, number of overnight stays and arrivals by citizenship of guests.

Statistics Iceland´s right to demand information from providers of accommodation is based upon the 10th clause in the laws on restaurants and accommodation establishments no. 67/1985: Managers, whom these laws come under, shall give the authorities information according to further instructions from Statistics Iceland. Such information shall only be used for research and organisation of tourism in general and/or the management of restaurants and accommodation establishments in particular as a profession.

Every accommodation establishment that sells accommodation is required to report the number of overnight stays and arrivals on a monthly basis. The reports shall have information on total number of arrivals and overnight stays by citizenship of guests, total number of rooms rented, total capacity; number of rooms and bed places, and, in case of seasonal openings, the opening months of the establishment. The data collection is carried out in compliance with the Council Directive on Tourism Statistics 95/57/EC.

The accommodation statistics give accurate and particularised information on capacity and occupancy, arrivals and overnight stays in accommodation establishments. The data includes total number of arrivals and overnight stays by type of accommodation, region and citizenship of guests, as well as room and bed capacity and occupancy rates in hotels and guesthouses by region.

Data is collected every month and the data collection is continuous. Preliminary data for hotels are provided in accordance to Statistics Iceland’s advance release calendar. Preliminary data is published monthly, 4-5 weeks after the reference period. Annual data for all types of accommodation establishments is published 3-4 months after the reference period.

Accuracy and reliability of published statistics is determined by the response rate as well as by the quality of the in-sent data. Estimations are made for all non-responding establishments.

Accommodation capacity has been mapped in detail and is known for all hotels and guesthouses, holiday centres, youth hostels and private home accommodation. Response rates are over 90% for hotels, and between 85-90% for hotels and guesthouses combined (based on capacity). Estimations for non-responding hotels and guesthouses are based on capacity as well as the development of the number of arrivals and overnight stays within each region. The largest camping sites report monthly, and the response rates for camping sites have been satisfactory, covering around 95% of the total overnight stays.

*2.2. Border Survey*

Since June 2017, The Icelandic Tourist Bureau in collaboration with Statistics Iceland has been conducting a Border Survey at Keflavík International Airport. Close to 99% of all arrivals/departures of tourists are through Keflavík International Airport, making it by far the most important entry/exit point for Iceland and the Icelandic economy.

The Border Survey has two components, one part which respondents answer manually at the airport, and a web based part which the respondents finish electronically once they are back at home. During preparations, care was taken to include questions on overnight stays and accommodation in the manual part of the border survey at Keflavik airport in order to produce statistics on all alternative accommodation. Respondents are asked about the number of nights they stayed in Iceland, and how many nights thereof they stayed at each of the following types of establishments:

* Hotel or guesthouse
* Other type of registered indoor accommodation (apartment hotel, hostel, cottage/cabin)
* Tent, caravan or camper van at an official campsite
* Rented private accommodation (through peer-to-peer portals such as Airbnb)
* Unpaid outdoor accommodation (tent, caravan or camper van not at an official campsite)
* Unpaid indoor accommodation (with friends/relatives, home exchange, couch-surfing etc.)

The nationality of a respondent is the nationality given in the interview in Keflavík Airport. The survey, for the purposes of collecting data on overnight stays, excludes travellers who are purely in transit and thus have not left the airport, as well as travellers who live in Iceland and are Icelandic citizens. Furthermore, the estimation of overnight stays is only based on respondents who say they were travelling as tourists of for short business trips. A prerequisite is that at least 2.000 respondents finish the manual part of the survey (including information on overnight stays) per month.

The weighting scheme uses the population number for a given nationality divided by the total number of travel party in the survey. This number is the same for all respondents for a given nationality.

Using the weighted results of the border survey, the number of overnight stays for the various types of establishments, in particular in private home accommodation as well as for unpaid indoor and outdoor overnight stays, is found by scaling the weighted number for hotels and guesthouses from the border survey against the reported number of overnight stays for hotels and guesthouses that Statistics Iceland receives directly from the accommodation establishments, and calculating standard errors of the estimators using the package 'survey' in R (Lumley, 2019) (Särndal, Swensson and Wretman, 1991).

*2.3. VAT turnover*

Those providers of private home accommodation who offer their services through Airbnb are charged a 3% service fee. This fee is subject to a 24% Value Added Tax (VAT), which Airbnb delivers to the Icelandic Directorate of Internal Revenue, in accordance to the law on VAT (Act 50/1988). This is used to estimate the VAT turnover of providers using the Airbnb platform.

*2.4. Web Scraping*

The Icelandic Tourist Board and Statistics Iceland receive monthly reports from AirDNA with information on supply, demand and occupancy rates of accommodation offered through Airbnb by region. Using these numbers for directly estimating overnight stays in private home accommodation was not deemed feasible. However, the data on capacity and occupancy are used to distribute the total number of overnight stays in private home accommodation into regions.

**3. Results**

Results of the Border Survey estimates for the number of overnight stays can be observed in Table 1. As can be seen, the Icelandic accommodation market was already saturated during the summer season of 2018. On the other hand, there is a marked increase from the corresponding month of the previous year during the off-season months of September-May 2017-2018, as well as during the autumn of 2018. The same saturation can be seen in the data for rented private accommodation, though comparison with the corresponding month of previous year is only available since June 2018. However, a higher variation and potential discrepancies in the %-change from the previous year when compared with registered overnight stays is a cause for concern and calls for further backing up, e.g. with VAT turnover information.

**Table 1. Overnight stays of foreign tourists in Icelandic accommodation establishments 2017-2018. %-change refers to the %-change from the corresponding month of the previous year.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Overnight stays | | | | %-change from previous year | | |
| Year | Month | Hotels and guesthouses (NACE 551) | Other registered accommo-dation (NACE 552 and 553) | Rented private accommodation | SE of rented private accommodation | Hotels and guesthouses (NACE 551) | Other registered accommodation (NACE 552 and 553) | Rented private accommodation |
| 2017 | June | 529,065 | 332,683 | 230,000 | 24.000 | 4.5% | 3.2% | - |
| 2017 | July | 640,116 | 505,529 | 330,000 | 19.000 | -1.3% | 1.0% | - |
| 2017 | August | 610,906 | 470,491 | 300,000 | 18.000 | -3.2% | -3.0% | - |
| 2017 | September | 485,070 | 197,305 | 200,000 | 12.000 | 7.6% | -1.8% | - |
| 2017 | October | 392,406 | 121,055 | 124,000 | 6.800 | 7.7% | 16.4% | - |
| 2017 | November | 309,239 | 88,982 | 95,000 | 4.700 | -2.1% | 4.8% | - |
| 2017 | December | 304,491 | 75,802 | 72,000 | 4.900 | 1.7% | -4.0% | - |
| 2018 | January | 302,132 | 71,917 | 111,000 | 7.000 | 1.6% | -3.4% | - |
| 2018 | February | 381,199 | 93,594 | 105,000 | 6.400 | 10.0% | 3.0% | - |
| 2018 | March | 410,069 | 110,094 | 120,000 | 7.800 | 7.4% | 9.3% | - |
| 2018 | April | 290,923 | 81,216 | 98,000 | 6.000 | -8.1% | -22.1% | - |
| 2018 | May | 373,721 | 155,174 | 127,000 | 8.400 | 3.7% | 9.9% | - |
| 2018 | June | 520,409 | 295,279 | 200,000 | 13.000 | -1.6% | -11.2% | -13.0% |
| 2018 | July | 631,041 | 453,542 | 240,000 | 15.000 | -1.4% | -10.3% | -27.3% |
| 2018 | August | 652,049 | 447,762 | 320,000 | 21.000 | 6.7% | -4.8% | 6.7% |
| 2018 | September | 549,629 | 228,600 | 170,000 | 11.000 | 13.3% | 15.9% | -15.0% |
| 2018 | October | 449,096 | 128,612 | 166,000 | 9.800 | 14.4% | 6.2% | 33.9% |
| 2018 | November | 319,629 | 90,848 | 88,000 | 7.000 | 3.4% | 2.1% | -7.4% |
| 2018 | December | 318,204 | 87,158 | 91,000 | 7.700 | 4.5% | 15.0% | 26.4% |

Source: Statistics Iceland (<http://www.statice.is>), in-house data for estimates and standard errors of overnight stays at rented private accommodation

Table 2 shows the VAT turnover estimates for rented private accommodation using Airbnb as a peer-to-peer platform for brokering accommodation, covering the period during which Border Survey data has been available for rented private accommodation. Since the data is reported in two month bins, the period on display begins in May 2017. The turnover numbers (in ISK) have neither been adjusted for inflation, nor for changes in exchange rates between the US dollar (the reference currency for the accommodation transactions) and the Icelandic króna (the currency used for handing in Value Added Tax).

**Table 2. Inferred VAT turnover of establishments and individuals offering rented private accommodation through Airbnb between May 2017 and December 2018.**

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Period | Million ISK | %-change |
| 2017 | May-Jun | 72.57498 | 5.8% |
| 2017 | Jul-Aug | 70.11398 | 10.4% |
| 2017 | Sep-Oct | 63.13141 | 23.9% |
| 2017 | Nov-Dec | 54.17849 | 8.1% |
| 2018 | Jan-Feb | 105.706 | 10.5% |
| 2018 | Mar-Apr | 93.18834 | 9.4% |
| 2018 | May-Jun | 93.41091 | 28.7% |
| 2018 | Jul-Aug | 78.02465 | 11.3% |
| 2018 | Sep-Oct | 86.40746 | 36.9% |
| 2018 | Nov-Dec | 67.0681 | 23.8% |

Source: Statistics Iceland (unpublished in-house data)

Preceding publication of official monthly statistics, minor adjustments of the number of overnight stays in rented private accommodation were made for 8 of the 19 months (October and November 2017; February, March, July-October 2018), in all cases within 1 SE of the corresponding estimate. Table 3 shows published regional statistics on the Statistics Iceland web comparing the number of overnight stays between the summer seasons of 2017 and 2018 (as represented by the months of June, July and August), where web scraped information from AirDNA have been used to estimate regional statistics. There was an estimated 14.4% decrease of overnight stays in rented private accommodation between the summer seasons of 2017 and 2018, most pronounced in the Capital and Southwest areas (18.7% and 24.2%, respectively).

**Table 3. Estimated unlisted overnight stays of foreign tourists (in 1.000s of overnight stays) during the summers months (June, July, August) of 2017 and 2018**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2017 | 2018 | %-change |
| Iceland Total | 880 | 753 | -14.4% |
| Capital Region | 513 | 417 | -18.7% |
| Southwest | 33 | 25 | -24.2% |
| West | 47 | 48 | 2.1% |
| Westfjords | 20 | 17 | -15.0% |
| Northwest | 17 | 17 | 0.0% |
| Northeast | 74 | 64 | -13.5% |
| East | 40 | 36 | -10.0% |
| South | 136 | 129 | -5.1% |

Source: <http://www.statice.is>

Numbers for unpaid indoor and outdoor accommodation can also be accessed through Statistics Iceland’s web portal (<http://www.statice.is>), albeit without regional breakdowns.

**4. Discussion**

The number of overnight stays in unregistered residential/private apartments (Airbnb, HomeAway, etc.) has grown substantially in recent years, as well as stays in campers/cars outside of regular camping sites. Unpaid house-swap and other unpaid overnight stays have also been growing as accommodation for foreign visitors. This type of accommodation is out of scope in comparable accommodation statistics, produced in line with EU regulation No 692/2011 and repealing Council Directive 95/57/EC, and is here referred to as alternative accommodation.

Early in 2017, Statistics Iceland decided to estimate Airbnb and similar overnight stays for 2016 and publish the results as part of accommodation statistics for 2016. At that time, it was already clear that the number of residential homes offered through Airbnb had grown considerably during the previous two years. Outside analysts had published reports where the share of Airbnb in overnight stays had grown from 10% to 30% of overnight stays and Airbnb was a popular topic in the media. It was clear that a good measurement was needed.

Estimations of the supply and occupancy involved in alternative accommodations came with its set of challenges. Information on establishments and availability was inconsistent with data from Airbnb. It was known that it would be possible to get estimates on Airbnb in Reykjavik and all of Iceland from several providers. Initially, the main effort was on analysing information from different sources, since some only provided information on Reykjavik, but others for all of Iceland. After analysis, it was decided to focus on web-scraping data, analysis and estimates from the provider AirDNA.co, and from a Canadian researcher who was known for sharing codes in order to scrape webs (<http://tomslee.net/>). Those efforts were used to publish estimates of the number of overnight stays through Airbnb and similar sites for 2016. This information was published by Statistics Iceland on April 12th 2017 (<https://www.statice.is/publications/news-archive/tourism/overnight-stays-2016/>). This approach was not deemed feasible for long term production of data series of overnight stays through alternative accommodation methods. This was in large part due to its reliance on outside sources, exemplified by the fact that one of the main providers ceased production of web scraping data shortly after the production of the 2016 overnight stays estimates.

Following this initial experiment, it was decided to develop a three-pronged approach. This involved

1. the Border Survey to estimate the monthly total number of overnight stays through alternative accommodation (i.e. residential accommodation and unpaid indoor and outdoor overnight stays),
2. web scraping for regional statistics,
3. information on VAT to help quality control the results.

As the vast majority of tourists coming to Iceland travel through Keflavik airport, there was great anticipation for the first results of the Border Survey. It was clear when the first results came, that this information would be valuable in estimating the share of each type of accommodation in Iceland. Since April 2018, Statistics Iceland has produced monthly statistics on all types of accommodation, both classic accommodation in line with EU regulation, as well as alternative accommodation such as unregistered residential/private apartments, campers/cars outside of camping sites, house-swapping and other unpaid overnight stays, using this method.

There are various potential sources of errors in this approach. They can come from any of the four sources of data used for this approach. Potential sources of errors in reported data on overnight stays can be from errors in the reports made by reporters, missing information or processing errors (i.e.. filing and classification errors). Owners/managers may refuse or postpone to send in reports. Reminders are sent out regularly by e-mail or by telephone to those who do not send in the reports on time. In those cases, estimations are made for the non-respondents. They can be based on capacity, development of tourism flows within each region as well as telephone interviews with local people involved. Currently, calculating a standard error for this estimation has not been implemented, making it possible that the standard errors of the final estimates for alternative accommodation are smaller than they should be. This is one of the issues currently being looked at. Processing and filing errors (i.e. figures could be wrongly filed into the database) are prevented and corrected as much as possible with error checks.

Regarding the border survey, care is taken by the party carrying out the survey at Keflavík Airport (Epinion) to avoid non-random sampling errors by the implementation of appropriate sampling schemes. Issues regarding the possibility, repercussions and possible solutions to non-random sampling errors are under consideration as the project progresses.

Regarding VAT turnover, the fact that Statistics Iceland only has information on the turnover for one specific platform provider (Airbnb) is a source of error. Also, it should be noted that over the last couple of years, Airbnb has been introducing the option of providing “experiences,” i.e. other types of tourism related services than private home accommodation. Given that Airbnb is by far the largest provider on the Icelandic private home accommodation market, the changes in VAT turnover through that platform may be taken as indicative of changes for the private accommodation market as a whole. Going forward however, it is necessary to look out for whether VAT turnover of parties providing the aforementioned experiences becomes a source of error on such a scale that it needs to be taken into account.

Web scraping is a delicate method, and prone to errors. It requires close follow-ups to note when changes are made to the coding of the site being scraped. Also, it is becoming more common that web-sites defend themselves against web scraping by using denial of service when visits are deemed too frequent. Reports sold by companies such as AirDNA—which does not have any business relations with Airbnb, but sells information based on web scraping on the Airbnb site—cannot be taken at face value and may tend to overestimate values and trends. Furthermore, information on websites are often unverified and put in as estimates with limited background information. Therefore, Statistics Iceland only uses AirDNA information to split the information generated from the VAT-turnover and the border survey to produce regional Airbnb statistics.

Since the Icelandic Tourist Board and Statistics Iceland started receiving information from AirDNA on the private home accommodation market brokered through Airbnb, there have been instances where such changes would have led to errors in the estimates of overnight stays, if based solely on web scraping material. However, the web scraping estimates of capacity and occupancy rates used to create regional statistics based on the total estimated number from the border survey were found to be robust with respect to those errors, and errors from those estimates were found to be within the scale set by the standard errors of the border survey approach.

This paper describes the method currently in use at Statistics Iceland to estimate the number of alternative overnight stays in Iceland. This involves a combined approach of using the Border Survey to estimate the monthly total number of overnight stays through alternative accommodation methods, web scraping for regional statistics, and information on VAT to help quality control the results. Since April 2018, Statistics Iceland has followed this approach to produce monthly statistics on alternative methods of accommodation. In the short time since its introduction, it has become a central part of national and financial decision-making processes. Discussion in the national media has become better informed, and people working e.g. in city planning, construction, rental markets and various tourism related industries have better data on which to base their decision making.

This approach is still under development, but the results during the year that has passed since first implementation are promising, and are an example of how Statistics Iceland is constantly trying to improve for the purposes of providing statistics that are in high demand among users in a timely fashion.

Over the last few months, the Icelandic private home accommodation market appears to be going through a lull, along with other activities related to tourism. The effort discussed in this paper helps analysers shed light on the development and progression of the changing overnight stays landscape during the last decade, and would not have been possible if swift action had not been taken during the initial phase of the private home accommodation boom.

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