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Coordination of international statistical work in the United Nations Economic Commission for Europe region: Outcomes of the recent in-depth reviews carried out by the Bureau of the Conference of European Statisticians

In-depth review of statistics on international migration and cross-border mobility

Prepared by Mexico

Summary

This document is a full version of the in-depth review paper on statistics on international migration and cross-border mobility. The in-depth review provides an overview of the activities of international organizations in this area and presents practices from selected countries: Mexico, Austria, New Zealand and the United Kingdom. It identifies issues and challenges and formulates conclusions and recommendations for further work. The last section summarises the discussion and decision by the Bureau in October 2019.

An abridged version of this in-depth review paper has been prepared for translation purposes and is available in English, French and Russian on the webpage of the sixty-eighth CES plenary session as document ECE/CES/2020/19.

IN-DEPTH REVIEW OF STATISTICS ON INTERNATIONAL MIGRATION AND CROSS-BORDER MOBILITY

Prepared by Mexico

I. INTRODUCTION

1. The Bureau of the Conference of European Statisticians (CES) regularly reviews selected statistical areas in depth. The aim of the reviews is to improve coordination of statistical activities in the UNECE region, identify gaps or duplication of work, and address emerging issues. The reviews focus on strategic issues and highlight concerns of statistical offices of both a conceptual and a coordinating nature.

2. The CES Bureau selected "international migration and cross-border mobility" for an in-depth review at its February 2019 meeting. The National Institute of Statistics and Geography (INEGI) of Mexico committed to prepare the paper providing the main basis for the review. The current document provides the basis for the review scheduled for the October 2019 meeting of the Bureau.

3. First, the paper presents the definitions of the concepts of international migration and cross-border mobility, followed by an overview of the different data sources used in national statistical offices. Second, the recommendations of international organizations to improve the collection of statistics on international migration and cross-border mobility are summarized. Third, the paper presents practices of measuring international migration and cross-border mobility in Mexico, Austria and New Zealand. Finally, the conclusions and challenges to measure international migration and cross-border mobility are presented.

4. Currently, censuses, surveys and administrative records do not capture all dimensions of short-term cross-border movements due to work or study. Information on international migration and cross-border mobility must come from a variety of data sources, which have their own strengths and limitations for the production of different statistics.

5. With the growing demand for migration data that arises from the 2030 Agenda for Sustainable Development, the international statistical community has taken on the task of reviewing the use of traditional sources of migration data, such as population and housing censuses, household surveys and administrative records; while seeking alternative sources to improve the collection and analysis of migration data.

6. Thus, the inclusion of migration in the new global development framework poses several challenges for statistical systems at the national and subnational level. Better use of existing data sources will be required, as well as the development of new methods to collect data on this topic. Related with the latter and made possible by technological progress, an unprecedented amount of data is being generated, this being known as "big data". These data can support the estimation of international migration in the long and short term. For example, the use of digital devices such as mobile phones and Internet-based platforms (email, Google, Facebook, Twitter, etc.) constitute such new sources that make it possible to fill some of the information gaps that traditional data sources do not cover. However, these sources present problems of accessibility, accuracy and access.

7. On the other hand, to improve the quality of migration statistics, several countries have recently started to use the opportunities offered by "data integration" as an approach to enriched and improved statistical information, which consists of a statistical process combining at least two different sources into a new data set.

8. Therefore, the production of statistics on international migration and cross-border mobility is challenged to have quality statistical information, to improve the comparability

of data and to achieve accessibility to existing information. Capturing this information requires coordination between national statistical offices and the institutions responsible for administrative records of migration control; as well as assistance in the methodological harmonization of data collection, to provide an adequate response to the political needs and the changing economic realities around the subject.

II. BACKGROUND

9. Throughout history, migration has been a manifestation of the willingness of people to improve their living conditions by changing their place of residence or they have been forced, in one way or another to leave their places of origin. These changes can be analysed from two perspectives: from the place of origin, which refers to the identification of people who leave an administrative unit (country) to move to another (emigration); and in the second instance, through the place of destination, that is, counting the number of people arriving from another place to reside, going to another determined administrative unit (immigration). Likewise, economic globalization generates a growing process of internationalization of labour, which has repercussions on profound transformations in productive processes. These have favoured temporary or short-term international cross-border labour mobility of people for reasons related to their occupation or work.

10. International migration and cross-border mobility present themselves with different intensity in all the countries of the world. Governments need reliable and timely statistics on these phenomena to formulate and apply public policies. Additionally, it is of vital importance to achieve the international comparison of migration statistics, achieve the harmonization of concept and definitions involved; as well as the revision of the methodology of its capture for statistical purposes.

11. Based on the 2018 report of the International Organization for Migration[1], the volume of international migrants reached an approximate number of 258 million in 2017, compared to 173 million in 2000. However, the proportion of international migrants among the world population is only slightly higher than that registered in recent decades: 3.4 per cent in 2017 compared to 2.8 per cent in 2000 and 2.3 per cent in 1980. Women constituted 48.0 per cent of migrants. Likewise, it is estimated that there are 36.1 million migrant children, 4.4 million international students and 150.3 million migrant workers.

12. According to the same source, there are approximately 68 million people displaced by force, including 25 million refugees, 3 million asylum seekers and more than 40 million internally displaced persons. Asia hosts approximately 31 per cent of the international migrant population, Europe 30, America 26, Africa 10 and Oceania 3 per cent. When compared with the size of the population in each region, shares of international migrants in 2015 were highest in Oceania, North America and Europe, where international migrants represented, respectively, 21 per cent, 15 per cent and 10 per cent of the total population. The impact of the flow of remittances is also significant and reached 436 billion dollars in 2014, almost four times more than the 126 billion official development assistance.

13. To approximate the knowledge of the real dimension of migration and cross-border mobility of international short and long term, the number of users of digital technology in

[1] International Organization of Migrations [IOM]. 2018 Report on Migration in the World. Retrieved from: https://publications.iom.int/system/files/pdf/wmr_2018_sp.pdf

the world must be measured. According to *Digital around the World in 2018*, the estimated number of users of mobile devices, Internet platforms and social networks worldwide in January 2018 was: 5.1 billion cell phone users, 4.0 billion Internet users, 3.2 billion active social media users[2].

III. AREA OF APPLICATION

14. This section is based on the following documents:

(a) Recommendations on International Migration Statistics [UN][3];

(b) Guidance on Data Integration for Measuring Migration [UNECE];

(c) Measuring International Labour Mobility [UNECE];

(d) Conference of European Statisticians Recommendations for the 2020 Censuses of Population and Housing [UNECE];

(e) Handbook on Measuring International Migration through Population Censuses. (draft as of 1 March 2017) [United Nations];

(f) Guidelines on international labour migration statistics [ILO];

(g) Migration data portal [OIM].

A. Concepts of international migration and cross-border mobility

15. International movement is defined as the movement of people who leave their country of origin or where they have their habitual residence, to settle temporarily or permanently in a country other than their own. These changes of residence can be analysed from two points of view: one is from the place of destination, that is, counting the number of people arriving from another place, to reside in a specific administrative unit, this is known as immigration. The other is from the place of origin, which refers to the identification of people who leave an administrative unit to move to another, this is known as emigration and both make up what is called migration[4].

16. Cross-border mobility is defined as the continuous and temporary movement of people within a territorial demarcation between countries, which implies the crossing of a border. An example of this is the flow of cross-border workers as long as they leave at short and periodic intervals; they are habitual non-residents of the country where they work, that the work is carried out during a short period of time; or that have been sent by their employer to work on a specific project for a limited and defined term.

B. Statistical activities to collect data on international migration and cross-border mobility

17. Statistics on international migration and cross-border mobility come from a variety of data sources that have strengths and limitations and can be used to produce different statistics. Data sources can be grouped into the following categories:

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[2] Migration Data Portal. Big data, migration and human mobility. IOM Recovered from: https://migrationdataportal.org/themes/big-data#definition

[3] The United Nations Expert Group on Migration Statistics is currently working on the revision of the 1998 Recommendations for statistics on international migration.

[4] International Organization for Migration Glossary on Migration. IOM (2019). Recovered from: http://publications.iom.int/es/system/files/pdf/iml_34_glossary.pdf

(a) Traditional population and housing censuses and surveys

18. For countries that have population censuses, these are perhaps the most widely available source of internationally comparable information on international migration in the world. Although censuses cannot capture the full picture of migration flows, they are by far the only source of international migration statistics for many countries. It is also possible for the population census to capture information about the place of residence one or five years before the enumeration.

19. The censuses provide official statistics on migrant populations and their socioeconomic characteristics, and also identify some migrant flows and immigration figures. United Nations Statistics Division recommends including three central variables in population censuses to identify international migrants, which are: (1) country of birth, (2) country of citizenship and (3) year or period of arrival in the country for people born abroad.

20. Surveys can delve into different aspects, such as the causes and impact of migration, socio-economic characteristics, migrant populations and migrant and emigrant flows, as well as impacts on the labour market.

21. In general, these two sources of information provide a partial estimate of statistics on international immigration flows, since, due to their characteristics, they do not cover the movements of people who have left the country before the census or survey, neither is information collected when all members of the observation unit emigrates in its entirety, because there is no one to report on emigration. Another characteristic presented by population censuses and household surveys is that its objective is to capture the resident population; therefore, the migrant population that is in transit or that who fear being deported for their irregular or non-legal immigration status is not captured, is not declared in the list of residents of the dwelling. It should also be taken into account that national population censuses are expensive, and prices rise every 10 years, and migrants can be difficult to capture. Surveys can also present problems with sample size and coverage.

(b) Administrative sources

22. On their part, administrative records are stored for the population on a certain legal basis; for example, records of entry and exit through established control sites (border posts, customs, etc.).

23. Administrative records are a vital data source for migration statistics. Administrative data is in general collected in the form of administrative records/events, not people, that is, a person can have several records of entry to the country within a specific period. If these records can identify and analyse the stocks and flows of migrants, they serve as a source of migration statistics. In the production of migration statistics, countries employ several administrative data sources:

(a) Countries with compulsory registration and deregistration of people who change their country of residence may use information from the registration offices to identify immigrations and emigrations and thus, if technically possible, immigrants and emigrants;

(b) Border data collection systems gather data of national and non-national migrants entering and leaving through official border posts;

(c) Also, visas, residence permits and/or work permits may allow producing statistics on migrant flows and populations, drivers and the impact of migration, as well as socio-economic characteristics.

(c) Innovative data sources

24. Thanks to the increasingly widespread use of digital devices such as mobile phones, Internet-based platforms, social networks and online payment services, detailed call logs and satellite images, the information that is available can be very useful for analysis of migration and international mobility, in particular of short-term migration flows. These innovative data sources (big data) are timely and provide real-time data; some are collected automatically and the potential of their coverage is very broad. In addition, such data can be obtained at a lower cost compared to data from traditional sources. The activity of social networks such as WhatsApp, Facebook, Twitter and LinkedIn, as well as the use of Internet-based platforms such as email, online payments or videoconferences have been used to infer international migration flows and populations of migrant stocks[5]. However, the data from these sources also have some limitations, which before using such information should be resolved as the differential coverage of certain populations that they have. For example, for certain age groups, sex, ethnicity and over time) or solve duplicate limitations, access to data held by private companies, among others.

25. Depending on the collected information and considering the limitations of this data, it may be feasible to carry out the study and analysis of mobility and migration patterns broken down by age, sex, skill levels, occupation sector, and other characteristics, and associate them with their geographical reference and / or place of residence; they can also be particularly useful for studying patterns of temporal or circular migration; estimating migration rates by sex and age group, international mobility patterns and the likelihood of users migrating to another country. Data on online searches can be useful for forecasting forced migration or the processing of asylum applications. These sources can provide an estimate of long and short-term international migration, and can help estimate forced displacement, transnational networks, human trafficking or remittance flows. They can also contribute to timelier monitoring of public opinion or media discourse on international migration.

(d) Integration of data from various sources of information

26. The data integration process is carried out through a statistical operation from various sources: censuses, surveys, administrative records or big data (to generate a new data set, which is not equal to “data source”), that is, organized information derived from selected data sources. In the case of migration, data sets can be integrated at micro and macro levels. For the micro level it is possible to achieve the registration link individually, which is possible if there is an identifier of the person available in all the datasets that are integrated. For integration at the macro level, that is, when aggregate data from single records, it is required, first of all, to clean up the differences in concepts and operational definitions of each source; second, to reconcile (“balance”) the data, using various statistical techniques or simply resorting to expert opinion.

[5] IOM. Migration data sources. International Organization for Migration. Recovered from: https://migrationdataportal.org/themes/migration-data-sources

27. Several countries (Austria, Italy, Latvia, Spain, Hungary, Israel, Netherlands, Switzerland, New Zealand, among others) are pursuing the integration of data from various sources (for example: records of population, health, labour, tax or education records) to improve migration statistics, either by linking data from several administrative records with surveys or population censuses, and even achieving their relationship with new data sources (big data). Several national statistical offices are working on the identification, evaluation and adoption of new methods and data sources that have a guaranteed quality through continuous quality assessment. Other uses deriving from the integration of data from various sources are reconciling migration figures, particularly the estimates of "hard to count" migratory populations such as irregular or illegal migrants[6].

(e) Data sources for estimating external migration flows in New Zealand

28. In order to present some examples on what national statistical offices are doing to use alternate sources and methods of gathering information to measure international migration flows, the following example is shared by the New Zealand national office.

29. New Zealand's migration estimates integrate the historical trend-based measure and the current outcomes-based measure. Both rely on information gathered by New Zealand's border administration and security agency, the New Zealand Customs Service, for the purpose of border administration and security. This administrative data consists of the following elements:

- Passport data of all travellers gathered as they cross the border, with names, dates of birth, passport numbers, citizenship, entry visa (if they require one to enter New Zealand), date of border-crossing, and flight number or ship name.
- Flight and ship information consisting of flight numbers or ship names, dates and times of arrivals and departures, number of souls on board, and flight routes.
- Passenger arrival cards, which include information about the origin of arriving travellers and their intended length of stay.
- Passenger departure cards (removed in November 2018), which include information about the destination of departing travellers and their intended length of absence.

1. Creating linked data, with identity resolution

30. In order to obtain as broad a picture of migration as the data sources allow, linking of data across the administrative ecosystem is required. Specifically, for migration measurements, New Zealand undertakes identity resolution within the border-crossing dataset, and linking across to arrival cards, and some geographic area information provided by an array of New Zealand government agencies. This work is carried out by Statistics New Zealand using data gathered by other agencies.

[6] UNECE. Guidance on Data Integration for Measuring Migration. United Nations, 2019, recovered from: https://www.unece.org/fileadmin/DAM/stats/publications/2018/ECECESSTAT20186.pdf

Identity resolution for creating travel histories

31. To create travel histories of travellers, we must first identify unique travellers, and find all the border-crossings that they have conducted. We do this by using data derived from passport information captured at the point of the border-crossing. This is as follows:

- If two of the three fields, passport number, date of birth, name (first and last), match across records, they are deemed to be the same person.
    - Having names as well as passport numbers allows us to correctly identify multiple passport holders as the same person.
- Each border-crossing related to a traveller is assigned a person identifier, essentially a sequential integer, allowing to compile a list of all border-crossings associated to a given traveller.
- Once this is done, the data is ready for a classification algorithm.

32. While identity resolution as described above allows us to measure migration using a classification rule applied to the travel sequences, passport information only provides a limited set of demographic attributes and provides no geographical information about the origin of the migrants, nor their place of settlement within New Zealand.

Data linkage for further attributes of data

33. Origin information for migrant arrivals is derived from arrival cards that all travellers must fill out as they enter the country, mostly for border and bio security reasons,. We consider this an administrative source of data.

34. In order to obtain this information, all arrival cards must be correctly linked to the travellers' border-crossing record. This is done as follows:

- All arrival cards are scanned by Stats NZ, and then put through an OCR process.
- Based on the flight information, time and day of arrival, passport number, and date of birth reported on the arrival card, the scanned OCRed responses are linked to the border-crossing record ascertained from the passport data.
- The OCRed responses, now linked to border-crossing data is processed, using probabilistic matching, in order to recover attribute information as reported by the traveller.
    - Where the automatic process is unable to identify the responses satisfactorily, they are sent to a manual processing system

Data linkage for NZ geographic information

35. Stats NZ receives unit record information from several government agencies, containing data on individuals who have interacted with the given agency. We undertake an extensive linking and matching process, based on probabilistic linking, to create what is termed an Integrated Data Infrastructure, containing information on individuals that have interacted with the New Zealand government. This data is periodically refreshed, allowing us to obtain snapshots in time of individual attributes[7].

36. This set is a rich source of information on the mesh-block areas for individuals residing in New Zealand. Border-crossing data is linked through to this dataset, using probabilistic matching, in order to obtain geographic information on where a migrant ends up settling, or where migrant departures originate from. This allows for the estimation of external subnational migration flows.

2. Considerations in the provision and use of sensitive data

37. Provision and use of this data is enabled through negotiation, and critically, by an "across government" approach to data sharing, where data is used to meet New Zealand's needs rather than simply by the agency collecting such data.

38. While this approach allows New Zealand to have a multitude of robust population measures, the information contained within the data is highly sensitive and must be treated with extreme care.

39. With New Zealand's approach, confidentiality and privacy principles, as well as informed consent philosophies, are robustly adhered to so that the social license to operate in this manner is both earned and maintained across the government data ecosystem. This requires an auditable security infrastructure and independent bodies that can assess the privacy and confidentiality considerations of data sharing. New Zealand employs external consultancies and independent crown entities to achieve confidence in its processes.

IV. SUMMARY OF RECOMMENDATIONS FOR MEASURING INTERNATIONAL MIGRATION AND CROSS-BORDER MOBILITY

40. International migration is currently one of the most salient issues not only to the global agenda, but also to the regional and national agendas, because of its complexity, scale, heterogeneity and multiplicity of purposes. For international organizations such as the United Nations Statistics Division, International Organization for Migration (IOM), the United Nations Economic Commission for Europe (UNECE), Organization for Economic Cooperation and Development (OECD), the International Organization of Work (ILO), among others, it is very important to work in collaboration with the national statistical offices to establish standards, concepts, categories, collection criteria and procedures which would allow producing comparable statistics on international migration and labour cross-border mobility. This section summarizes the most relevant recommendations on this topic.

A. International recommendations for censuses

41. The United Nations principles and recommendations for the Census Round of 2020[8] attributed crucial importance to the fact that population censuses have to be designed to meet national needs. The census' topics and questions should be written in such manner that respondents can and want to provide adequate information about them, and the questions that are difficult and complicated for respondents should be avoided. Therefore, no country should try to cover all the topics suggested or included in the list of population issues[9].

[8] UN. Principles and recommendations for population and housing censuses, Revision 3, Series M, No. 67, Statistics Division, United Nations, New York, 2017. Recovered from: https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Principles_and_Recommendations/Population-and-Housing-Censuses/Series_M67rev3-E.pdf

[9] *Ibid.* p. 172.

42. The recommendations for the 2010 census round in Latin America[10] of ECLAC point out that crossing a border between countries is usually not subject to declaration and voluntary or mandatory registration by the population and even authorities, and recognizes that people have many incentives and procedures to avoid participating in such registration, and that the quality of statistics to differentiate migration from other movements between countries is poor.

43. In summary, ECLAC gives the following specific recommendations on measuring international migration in the census:

(a) Consolidate the questions that have already been used in the censuses of the region: country of birth, year or period of arrival to the country and usual residence from five years earlier;

(b) Ask these three basic questions - country of birth, date of arrival and country of habitual residence five years ago - from the entire universe;

(c) Include the question of the year of arrival to the current country of residence;

(d) The way to capture the answers to all these questions should allow a detailed distinction of the countries of origin through the existing international classifications. The coding must allow the identification of each country of origin;

(e) In case of asking about nationality, the answer does not replace the questions about the country of birth for the study of international migration.

44. Also, the ECLAC recommendations recognize the potential of the census to measure daily mobility. Until 2010, the experience of asking about the characteristics of these daily movements has been limited to at least six countries in the region, in various modalities. In all cases, daily mobility is considered to be a displacement from the usual residence carried out with certain frequency, with reference to the main motivation (work or study), the territory in which these displacements are carried out (municipality, state and country) and with a mainly urban character.

45. Censuses provide several advantages in terms of information on daily mobility. The most obvious is the potential to associate daily mobility with other demographic characteristics. Likewise, the collection of data on daily mobility through this source can answer several questions of interest in planning matters.

46. Specific recommendations of ECLAC for this issue are:

(a) Include two questions, separately, to measure the mobility of a certain frequency and regularity between the place of habitual residence and the work -remunerated- or study;

[10] UN, (ECLAC, CELADE, UNFPA). Recommendations for the censuses of the 2010 decade in Latin America, United Nations, Santiago, Chile, 2011. Retrieved from: https://repositorio.cepal.org/bitstream/handle/11362/5511/1/S1100525_en.pdf

(b) That the information must be collected using the same geographical scale that was used for the measurement of internal migration;

(c) Include the question or questions about daily mobility in the questionnaire of the sample or the universe;

(d) Include information on the frequency of trips from the place of residence to work or study;

(e) Also measure the usual means of transport and the approximate duration of the trip, taking into account the experience of other countries such as Spain and the United States of America, whose duration of the trip is not a good approximation to the travelled distance.

B. International recommendations for surveys

47. For the application of surveys that capture information on issues of international migration and cross-border mobility, it is necessary to follow the international recommendations that mark the uniform guidelines based on comparison criteria for the capture of data.

48. The recommendations are derived from the Recommendations on International Migration Statistics, Revision 1 (1998), adopted by the United Nations Statistical Commission, the Resolution on Labour Statistics, Occupation and Underutilization of the Labour Force adopted by the 19th International Conference of Labour Statisticians in 2013, and of the 20th. International Conference of Labour Statisticians in Geneva, which was held in October 10-19, 2018 by ILO, which should be applied to household surveys, particularly labour force surveys (especially relevant in the case of certain groups, such as international migrant workers) (usual residents); demographic and specialized migration surveys; surveys that are limited to or focused on specific populations or areas (such as surveys in areas near international borders or surveys of refugee camps); and sample surveys.

49. The international recommendations on international migration have, as one of their main objectives, to try to answer a number of questions that are considered fundamental to understanding the dynamics, causes and consequences of international migration. Within the survey-focused recommendations, it is requested that you apply the same definitions of international migrants (as well as the other definitions inherent to the topic); be careful to measure the variables that are captured, as in some cases the information may be underestimated. For example, household surveys do not validate information on citizenship, which could lead to declaration errors, etc.[11].

50. Recently the international recommendations for surveys focus primarily on the field of labour migration, and they are aimed at helping countries to develop their national statistics on international labour migration and encouraging them to test the proposed framework. The information should include data on the main socio-demographic characteristics, the migratory status and employment status of international migrant workers,

[11] UN, Recommendations on International Migration Statistics, Revision 1, Series M, No. 58, United Nations, New York, (1999). Recovered from: https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Principles_and_Recommendations/International-Migration/SeriesM_58rev1-S.pdf

international migrants in search of work and international migrant workers returning to their country[12].

51. However, national statistical systems have difficulties in providing information on short-term and irregular movements, especially if both workers and employers are not residents of the country that compiles the statistics. To assess the impact of labour mobility, there must be an integration of the information of the country of origin, as well as that of the destination of the population. On account for this, coordination is required among the statistical systems that carry out the data collection of the involved countries. Therefore, it is essential that there is a greater international harmonization of the concepts, definitions and methodology used to measure labour mobility. The harmonized information will allow generating indicators on labour, productivity, compilation of the balance of payments; as well as its integration into national accounts statistics. Likewise, it will be crucial for the elaboration of labour policies, for the management of migration, and the making of commercial agreements and the providing of services[13].

52. Eventually, to assess the impact of international migration and labour mobility, an additional effort is required to produce comparable statistics, yet many surveys that are designed to capture the resident population are derived from sampling based on traditional censuses; and only a minority of countries extract the sample from population records. For this reason, to capture the different flows of international migrant workers, the design of the surveys should consider the following:

(a) Adjust sampling frames;

(b) Define a sample size large enough to ensure adequate coverage and to provide reliable estimates for foreign populations;

(c) Build special data collection instruments;

(d) Use standardized and internationally comparable classifications;

(e) Resolve language barriers in the design of questions;

(f) Train interviewers adequately;

(g) Establish specific reference periods for each population´s universe, being them international migrants, temporary workers, frontier workers, short-term workers, or other categories of migrants.

53. Likewise, surveys focused on capturing the phenomenon of international migration and labour mobility should consider covering sociodemographic characteristics of the target population, such as: their age, level of education, profession, ethnicity, country of birth and/or country of previous residence, etc.; also, the main employment characteristics: status of employed or unemployed, branch of economic activity, occupation or performer occupation, position while on the occupation, working time, type of employment contract,

[12] ILO, Report of the 20th International Conference of Labor Statisticians (Geneva, October 10-19, 2018). Recovered from: https://www.ilo.org/global/statistics-and-databases/meetings-and-events/international-conference-of-labour-statisticians/20/WCMS_651213/lang--en/index.htm

[13] ILO. Appendix: Draft guidelines on international labour migration statistics 20a. International Conference of Labour Statisticians. Geneva, October 10-19, 2018 https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/meetingdocument/wcms_646762.pdf

length of occupation, income related to occupation, remittances sent out of the country of connection to the labour market, social security benefits in the country of connection to the labour market, occupational injuries, participation in the formal or informal employment sector. To achieve the availability of this great diversity of information, its complementarity of the different sources of statistical data should be sought, and they should be used in combination to obtain, as far as possible, new data sets. To do this, we must consider carrying out demographic and specialized migration surveys; surveys in areas near international borders, in refugee camps or design special surveys oriented to the particular characteristics and circumstances of the study universes, which poses a major challenge for information generators.

C. International recommendations for administrative records

54. The United Nations Recommendations [14] refer to population registers and the registration of foreigners at the border (control sites) as the main administrative sources for international migration statistics. These records are mainly for administrative purposes, with a legal basis that supports them, and they can provide updated statistical information on the size and characteristics of the population in question.

55. National population registers are one of the best sources of comprehensive statistics on international migration. They generate statistics of entrances and exits and can provide statistics in which the circulation of foreigners and citizens is treated, provided that registration rules are applied in a similar way to foreigners and to citizens. However, as the registration and cancellation rules vary from one country to another, the data are not strictly comparable internationally.

56. One of these variations is when countries require different periods of stay (or absence) for registration (or deletion) registry. Foreigners' records work in a similar way to population registers, but they cover only foreigners with legal residence in the country in question, this means that all illegal migration is outside the statistics and other sources of information should be used for its estimation.

57. As in the case of the records of the national population, the conditions for the registration or elimination of foreigners from the registries define the persons that can be considered international migrants. Foreigners' records generally give priority to the annotation of the status of each registered person with regard to migration, including the type of residence permit, the period of validity, etc., and therefore can provide information on specific categories of international migrants. Among the disadvantages of foreigners' records, the main one is that they do not contain information on the international movements of citizens. Furthermore, although they usually include fairly complete information on the entry of foreigners who have been granted a residence permit in the country, information on those who leave the country for long periods or permanently less complete, mainly because the cancellation of registration usually involves the loss of the right of return, so there is some reluctance to declare the exit.

58. As for short-term migration, only the population registers in which people whose expected stay in the country are reported at least three months, are likely to contain complete information on short-term migrants. However, when the reasons for immigration are usually

[14] UN, Recommendations on International Migration Statistics, Revision 1, M Series, No. 58, United Nations, New York, 1999.

not stated in the population registers, it is not possible to take into account the exceptions made for short-term migrants. However, since population records allow the situation of registered persons to be examined after one year, they can provide information on the subset of people who actually leave the country before the end of the year. From these observations it follows that administrative records can provide valuable information about international migration. However, no source provides complete information on all the important aspects.

59. Other sources of records, corresponding to the collection of information at points of entry and exit of a country, regardless of whether they are actually national border (include airports and other places where people come or formally leave a national territory, such as seaports or land borders). The collection of data at the border can be based on legal documents and statistical forms. The legal documents through which the status of people arriving and departing are established include passports, visas, residence permits, etc. Statistical forms, on the other hand, refer specifically to boarding and disembarkation cards required by arriving and departing passengers.

60. Administrative sources other than registries also produce data that are indicative of entry or exit of particular groups of international migrants. Certain administrative sources refer to even more specific groups of people. For example, data on the number of asylum applications for a period. In addition, records kept by tax or social security authorities are a potential source of information on the number of foreigners who pay taxes or are covered by social security. The data derived from these sources are indicative of the size of the foreign population employed, such as information obtained from establishment reports (i.e., companies, and manufacturing facilities) on the number of foreign workers they employ[15].

D. International recommendations for innovative data sources

61. Regarding the methodologies to capture information on international migration and cross-border mobility from new sources, international recommendations are in the process of development and consolidation, where there are experimental and research works to establish guidelines and methodologies for a better use of the information derived from new data sources generated by users of mobile devices, Internet-based platforms, among others[16].

62. Of the main aspects in development, there is the methodology to correct the bias that is presented by having a greater representation of certain population groups over others, because in the social networks there is a greater representation of young population, while the older people are less represented. Similarly, there can be a differential in Internet access or the use of mobile devices and social media platforms by place of residence: urban/rural areas, the socioeconomic characteristics of the population, sex, schooling, occupation, so that work must be done to correct or to adjust the methodological aspects associated with such bias.

63. It is also necessary to create adequate legislative and regulatory frameworks to safeguard the confidentiality of information; as well as to guarantee privacy and ethical management with respect to the collection and use of data that is collected on mobile devices, social networks and Internet platforms. The objective of these projects is to produce

[15] United Nations, Handbook on Measuring International Migration through Population Censuses, Draft as of 1 March 2017,
recovered form: https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Handbooks/international-migration/2017-draft-E.pdf

[16] IOM Big data, migration and human mobility. International Organization for Migration. Recovered from: https://migrationdataportal.org/themes/migration-data-sources

guidelines and recommendations of fundamental rights in the use of artificial intelligence for the development of public policies, since there is a risk and concern that they serve to limit civil liberties due to the risks of using such data for surveillance purposes, particularly in the context of irregular migration and forced displacement.

64. Likewise, working groups have been formed aimed at the development of methodologies for the use of artificial intelligence, as well as machine learning, with the aim of exploiting and extracting more efficiently the meaning of the complex and huge volumes of information deposited in the databases generated by the new technology, determining which sources can provide more useful and reliable information on the subject of migration and international mobility, as well as understanding the measurement error inherent in big data sources to increase predictive capacity of models based on these sources and facilitate decision making.

E. International recommendations for the integration of data from various sources

65. According to the UNECE *Guidance of Data Integration for Measuring Migration* (2019)[17], the integration of information has gained strength in recent years due to the importance of improving the quality of statistical data for certain population issues. Particularly in the case of international migration, the use of records from different types of administrative data sources linked with information obtained from surveys and censuses opens a window of opportunity to improve the quality and integrity of data for this theme.

66. In the case of migration, the data sources for integration include surveys, census, administrative records and big data. Integration could take place at the micro and macro levels. The first is approached from the availability of a common identifier (PIN), which allows linking of records or statistical comparison of records between sources at an individual level, which should be available at all the data sets. The second approach refers to the reconciliation of micro-data from the different sources using statistical techniques. The statistical activity of data integration must be seen as a process with cycles of updating with new information input.

67. Data integration will give rise to a "single" or new data set where all the input information is reorganized. This is not simply the union of multiple data sets, since redundancies, conceptual differences and any other source of bias must be adequately addressed, which results in a new structured data set of higher quality, whose elements have been changed due to the integration of data with an increased statistical quality.

68. By combining various administrative records (such as health, education, employment, etc.) with information obtained from the population census and statistical surveys, higher quality estimates can be provided. It allows to incorporate variables that enrich information on each migrant person or migratory event. It also seeks to compare and exchange information on migration with other countries using so-called "mirror" statistics, which account for the migratory flow from the country of origin to the country of destination. This practice is useful to understand migration processes and improve migration measurement systems.

[17] UNECE. Guidance on Data Integration for Measuring Migration. United Nations, 2019, Recovered from: https://www.unece.org/fileadmin/DAM/stats/publications/2018/ECECESSTAT20186.pdf

V. PRACTICES OF SELECTED COUNTRIES

A. Case study: Mexico

(a) Censuses

69. The main objective of the population and housing census is to update the account of the resident population of the country, as well as information on its structure and its main socio-economic and cultural characteristics, in addition to its distribution in the national territory; in the same way, the total housing count and its characteristics, without losing, as much as possible, the historical comparability at national and international level.

70. In the history of censuses in Mexico, there is a long tradition of inquiring about international migration, particularly for accumulated international immigration, based on the question about the place of birth, included since the year 1900 in the census questionnaires. However, it is really recent to include a module with questions that account for international migration, particularly for migration and circular migration.

71. Only in the 2000 census, the cause of the emigration was asked. In addition, labour mobility has been a concern since the 2000 census, for this reason the expanded questionnaire included the question about the place of work, with which the municipality or delegation (now mayor's office), entity or country where the business was located was captured, company or place where the person worked. Labour mobility refers to daily mobility that involves the crossing of municipal boundaries within an entity, between states, or to another country.

72. In the 1999 Census Recommendations, the United Nations defines international migration as changing country of habitual residence, i.e. where does the person have a place to live and where does he or she normally rest. Under this definition, the National Institute of Statistics and Geography (INEGI) implemented in the 2000 and 2010 censuses a series of questions to capture and offer results that contribute to the measurement of the phenomenon through three questions: i) Place of birth, ii) Place of residence five years ago, and iii) Year of departure to the current country of residence (date of emigration).

73. Since then, and without neglecting international recommendations and the demand for information, in the first censuses of this century, a set of specific questions was also contemplated to capture international migration during the last five years prior to the interview. In both cases, the variables considered in the group of questions are divided into two parts. In the first, three pre-questions of control were made: during the last 5 years did some person who lives or lived in the house go to live in another country, with it the international migration condition is verified; in the affirmative case, it is investigated by the number of migrants and the investigation of them. Next, we inquire about the residency status and, if affirmative, that the person was a resident of the dwelling, the questions related to the sex and age of the international emigrants are asked, by the date of emigration, the place of origin, the country of destination, the current country of residence, the date of return and the current residence status. With them, the main entities of origin of the emigrants and the main countries of destination are identified, the total number of registered migrants is determined, how many of them returned to Mexico and how many still remain outside the country.

(b) Surveys

74. In the case of Mexico, the collection of information on topics of international migration and mobility border can be obtained from surveys such as the National Survey of the Demographic Dynamics (ENADID), National Income and Expenditure Survey (ENIGH) National Survey of Occupation and Employment (ENOE) and the Retrospective Demographic Survey (EDER), whose characteristics are mentioned below.

1. Intercensal Survey 2015 (EIC 2015)

75. The survey was carried out with the purpose of updating the socio-demographic information in the middle of the period between the 2010 census and the one to be carried out in 2020. It covers issues present in the latest censuses and is comparable to them. In the questionnaire, migratory information is collected from the entity or country of birth and the entity or country of residence from five years ago. It also captures the mobility to study (school) through the place of study (municipality of study and entity or country of study); and labour mobility through the workplace (municipality of work and entity or country of work). As an innovation in this project, a question was included to have an estimate of the population resident in Mexico and that has Mexican nationality.

2. National Survey of the Demographic Dynamics (ENADID)

76. From the available microdata it is possible to carry out an analysis on international migration from the place of birth, place of residence one year and five years before; as well as the one presented during the last five years. This allows us to calculate the number of international migrants, the cause of migration and relate it to the employment situation, schooling, duration of the movement, among other topics.

3. National Household Income and Expenditure Survey (ENIGH)

77. In this survey the target population are the homes of national and foreign habitual residents in the national territory. Microdata are available on income and expenses and it is possible to make comparisons on sociodemographic characteristics between nationals and foreign-born persons.

4. National Survey of Occupation and Employment (ENOE)

78. Although usual residents of selected households are the target population of ENOE, the main objective of the survey is to determine the economic characteristics of people of 15 years or older. In addition, in the ENOE questionnaire people were asked if they had to change their place of residence to seek or maintain this work and in what state or country lived before the movement, which can be useful for studying labour mobility.

5. Retrospective Demographic Survey (EDER)

79. To have broader retrospective information, this survey investigates the life history of people from 20 to 54 years of age, in terms of migration, education, work, family, marriage, fertility, contraception and disability, etc. With the collected information it is possible to identify each of migratory population movements from the place of birth and place of residence, and register each of the places where people have lived for at least a full year continuously or migratory events lasting less than one year.

6. Survey on Migration in the Northern Border of Mexico (EMIF North)

80. The survey provides elements of analysis based on direct and reliable information on the dynamics, magnitude and characteristics of migratory flows of Mexican workers to the United States, to know their characteristics, volume, trends; as well as its impact on the labour market in both societies.

7. Survey on migration in the southern border (EMIF South)

81. This survey considers the flows of people born in Guatemala, El Salvador and Honduras. Its objective is to deepen the knowledge of the migratory labour flow that crosses the border between Guatemala and Mexico, with the purpose of working in Mexico or the United States, as well as the undocumented migrants who use the Mexican territory as a transit country and are returned by immigration authorities of Mexico and United States; quantify the volume of migratory flows, as well as the conditions and work trajectories of the people who integrate them.

82. These last two surveys (EMIF North and EMIF South) are in charge of: El Colegio de la Frontera Norte (EL COLEF); Ministry of the Interior (SEGOB); National Population Council (CONAPO); Ministry of Labour and Social Security (STPS); the Immigration Policy Unit of the Ministry of the Interior (UPM); the Ministry of Foreign Affairs (SRE); the National Council to Prevent Discrimination (CONAPRED) and the Secretariat of Social Development (SEDESOL).

(c) Administrative records

83. Regarding the use of administrative records to generate statistical information in Mexico, it is the Ministry of the Interior (SEGOB), through the Migratory Studies Centre, which, among others, has promoted the modernization of the National Migration Institute (INM) records since 2009. To use them as a source of migratory statistics in order to be an alternative source to censuses and surveys, this in line with the Law of the National System of Statistical and Geographic Information, which as of 2008 proposes to take advantage of administrative records as a primary source of information.

84. According to this, the immigration statistics provided by INM uses the information that must be included in standard formats of migration. Therefore, migration statistics are divided into five themes: a) ticket flows, b) legal stay, c) staying and returning foreigners, d) shares of Beta migrant protection groups and; e) Mexicans repatriated from the United States of America.

85. The basic sources are a) individual electronic register, b) government and books; c) registration lists; tending to the use of electronic databases with individual records.

86. The stages of collection, processing, analysis and dissemination have been refined and standardized to reduce publication times and improve quality and comparability, giving special attention to the analysis and conversion of registration data to statistical data with consequent conceptual redefinitions, classifications, coverage and analysis of possible changes in policies or regulations.

87. A challenge that is being worked on is the integration of sociodemographic characteristics of migrants that do not capture the INM instruments, as well as the

standardization of catalogues and variables used by the systems of the units that produce the records.

88. Finally, with the INM data it is possible to obtain information about international mobility, understood as the displacement of people from one place to another within the administrative limits of a country or outside of it due to change of residence or other, of people in three areas: a) non-migratory international movements, such as those carried out for tourism or business purposes, b) international migration of foreign immigrants to Mexico, and c) partially undocumented transit migration, as well as forced return of Mexican emigrants.

89. On the other hand, Mexico has a large number of information sources on cross-border mobility and international migration. They have different scopes and objectives, but they account for the migration of origin, transit, destination and return. Thus, the Centre for Migration Studies and the National Population Council of SEGOB take advantage of surveys, censuses and administrative records to generate statistical information on these subjects.

(d) Integration of innovative data sources

90. Mexico participates in the UNECE team on machine learning techniques (under the High-level Group for the Modernization of Official Statistics) to improve the production of official statistics. It also includes the exchange of knowledge and experience in machine learning techniques. This group focuses on advancing the use of machine learning techniques in the following areas in the production of official statistics:

i. Classification and codification of traditional data sources (surveys, censuses) and non-traditional sources: use of web data and opinion analysis.

ii. Use of satellite images.

(e) Integration of figures from different sources

91. The estimated component of emigrant population of Mexico can be divided into two main flows, one to the United States of America and another to the rest of countries. This is because, according to the census results in Mexico, 90% of the population exchange occurs with the United States. Therefore, the use of the data of the American Community Survey (ACS) is fundamental. From this survey it is possible to subdivide the flow to refine the estimate in: born in Mexico to the United States, and born in Mexico to the United States but from Mexico. For the estimation of the first ones, we resort to the results of the question about place of birth and the year of arrival to the United States (of the ACS). While for the estimation of the second group, the question about the place of residence one year before is additionally considered. The estimation for the rest of the countries is done indirectly from the census results of Mexico with the International Migration module of the expanded questionnaire. In this way we obtain the relationship by sex, age and expelling federation of the number of and migrants to other countries for every 100 emigrants to the United States. Thus, the quantitative approximation of the total flow of emigrants from Mexico is achieved through integrating data from US and Mexican sources.

92. On the other hand, one of the practices that is being used to improve the available information, is cooperation between countries of the region, which share migratory phenomena. Therefore, we are currently working on the signing of a Memorandum of

understanding and cooperation between the statistical offices of Canada, the United States and Mexico with the objective of improving the measurement of international migration statistics of the three countries, for which the exchange of methodological information, evaluation of figures and improving comparability as well as the exchange of data is planned.

B. Case study: Austria

93. Since 2002, Austrian migration statistics are based upon data from the Central Register of Residence (*Zentrales Melderegister*, ZMR). Residents who establish their home in a private or institutional household have the legal obligation to register and de-register their residence within 3 days of moving. All residents, independent from their nationality[18] or length of stay must register if their stay exceeds three days[19]. Statistics Austria receives and processes all residence registrations and de-registrations on a quarterly basis.

94. Data from the Central Register of Residence are enhanced by integrating data in two separate processes. First, information on deaths from the Organisation of Austrian Social Security (*Hauptverband der Sozialversicherungsträger*, HV) is linked to the residence register at the unit record level adding information of deceased persons and their missing de-registrations. Second, in order to adjust for missing de-registrations of emigrants, yearly estimations identify potential nominal members employing information from several administrative data sources. While both steps link data on the micro-level in the final stage, the underlying processes differ substantially.

(a) Adjusting for uncounted deaths in the population register

95. Data from the Organisation of the Austrian Social Security serves as a supplementary data source for improving the data quality of Austrian population and migration statistics. The Organisation of the Austrian Social Security is an umbrella organisation of all social security funds in Austria. It collects information on all persons insured in Austria and their dependents. Their data base covers information on the insurance status, but not necessarily on the residence registration status[20]. Therefore, the residence register and the social security database have partly overlapping populations but also cover categories of persons which are only represented in one or the other data base.

96. Registration of deaths is compulsory for all deaths occurring on national territory as well as deaths of Austrian nationals occurring abroad in the Central Register of Civil Status (ZPR). Succeeding the death registration, the deceased is de-registered in the residence register. However, deaths of Austrian residents of foreign nationality, occurring on foreign territory are not subject to registration. The notice of death may reach the Austrian authorities only with delay.

97. The social security data base thus supplies complementary information on deaths and is therefore employed to refine the total population and migration count. These data are matched to the migration flows from the residence register via bPK, an anonymised 27-digit key that allows connecting information from different administrative data sources.

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[18] Including asylum seekers and refugees

[19] Foreign diplomatic personnel are exempt from registration.

[20] The social security data base covers i.e. commuters from abroad without residence in Austria but does not supply any information on persons who have never been insured, received pension payments, child support or any other social service.

(b) Estimation of potential nominal members in the population register

98. At the reference date of register-based censuses (the last being on 31 October 2011) people occurring only in the Central Register of Residence, but in no other administrative register are identified as suspicious cases necessitating further investigation. They are addressed to confirm their presence in Austria. Those not having responded are seen as nominal members and therefore excluded statistically from the population. Municipalities also get knowledge of the results and are asked to clean up their administrative records.

99. For the inter-censal period a similar exercise is undertaken annually. In this case, people are not addressed directly to confirm their presence, but rather a share of those identified as unique cases in the Central Register of Residence are statistically excluded from the total population. The likelihood of being a nominal member is determined by applying a logistic regression model[21].

100. The results of this exercise are integrated into quarterly population statistics once a year (upon publication of the final results). Deviations between quarterly population statistics and those identified as nominal members by the so-called mini register-based census are integrated in two ways:

i. By relocation abroad of non-recognised registered residents; and

ii. By relocation from abroad of previously non-recognised residents.

101. The population adjustment for nominal members thus has an impact on the migration flows in a direct way. Potential nominal members not recognised in population stocks are assumed to have relocated abroad (and thus statistically counted as emigration). In turn, previously non-recognised residents can re-join the population stock if they show life-signs in other administrative records than the residence register in the consecutive year. In this case, a statistical record for re-entry to Austria (immigration) is created.

102. In contrast to directly linking information from a single other data source at the micro level (as in step 1), a different methodological approach is used: first, several data sources are consulted to identify registered residents who are potential nominal members, and second, statistical estimation techniques finally select the individuals who will no longer be recognised residents. Here, data linkage on the unit record level creating statistically produced emigrations and immigrations is only a downstream process in the estimation of nominal members from various administrative records.

C. Case study: New Zealand

103. New Zealand measures both flows and stocks of migration, as well as the characteristics of these. Migration flows are primarily measured using administrative data, in the form of border-crossing data collected for the purposes of border control. Migration stocks are measured by a variety of sources including censuses, visa data, and aggregation of flow data. In addition to these, data from household surveys are used for research into migrant wellbeing.

[21] Detailed documentation in German:
http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=073537

(a) Concepts of measurement

104. Several concepts are used when measuring migration in New Zealand. These can be summarized as follows:

(a) Migration stocks based on a single census: The population of residents born overseas is directly measured via census questions. In this measure, New Zealand born persons returning as migrants are not included in the stock of migrants. Migrant departures are also not measured;

(b) Migration stocks based on visa data: Different populations of migrants based on the visas they hold at a given time are estimated by New Zealand's immigration authority. This does not measure returning New Zealand citizen migrants;

(c) Migration flows: Definition of migration congruent with the resident population concept is used. A border-crossing is classified as a migrant crossing depending on the time spent in/out of New Zealand before and after the border crossing. In this definition the place of birth, citizenship, or visa type of a given traveller do not affect migration status. This is the headline measure of migration in New Zealand.

(b) Measurement of migrant stocks

1. Census questionnaire

105. The New Zealand census asks respondents where they were born. This allows for a stock of overseas born residents to be taken each census. However, this does not capture many aspects of migration, including migrant departures, and returning migrants (e.g. New Zealand born residents who lived overseas for an extended period and returned to New Zealand or overseas born residents returning after an extended intercensal absence). There are also limitations of this measure due to census under and over coverage.

106. In addition, the census asks respondents about their address one or five years ago. Examination of these responses would allow a partial estimate of returning migrants. However, if they left and returned to New Zealand within the one/five-year period, those changes would not be captured with the question.

107. Census also attempts to identify an array of attributes of respondents including ethnicities, incomes and family units. Capture of these attributes allows New Zealand to provide insight into a range of indicators from income to family structures of its overseas born residents.

108. Therefore, census can provide a reliable measure of the stock of overseas born residents in New Zealand, along with an account of their quantifiable circumstances.

2. Migration stocks based on visa data

109. New Zealand's Ministry of Business, Innovation, and Employment (MBIE), the parent department of the New Zealand Immigration Service, produces estimates of stocks based on the visas held by new arrivals and those already on shore. This is based on a combination of visa approvals data, and information on whether individuals holding the given visas have entered New Zealand.

110. This measure can identify the stocks within the different legal categories under which non-New Zealand citizens can be in the country. Because the measure applies to individuals that require visas to enter or be in New Zealand, it does not measure the migrations of New Zealand/Australian citizens. A view of the stocks are available through a dashboard which MBIE uses as a publication tool. Note that the dashboard also contains flow data for travellers who require visas to enter New Zealand.

111. These measures are especially useful for evaluating the effects of migration policy changes that the agency has control over. Analysis of such data is used to set new policy or tweak existing settings.

(c) Measurement of migration flows

112. Until recently, migration arrival and departure flows were largely based on the responses provided by travellers on their passenger cards when crossing the border. The intention to stay in New Zealand (or leave New Zealand) for 12 months or more, as reported by the traveller, was used to determine whether the border-crossing was a migrant crossing. This measure allowed New Zealand to produce some of the timeliest migration statistics in the world.

113. However, intercensal discrepancies, and analysis involving total traveller in-flows and out-flows showed that the measure was generating inaccuracies in the migration estimates, particularly between 2001 and 2006, where net migration was likely under-estimated by approximately 50,000 over five years.

114. This led to the development of an outcomes-based measure of migration, where, rather than a traveller's stated intention, the amount of time they spent in or out of New Zealand was used to determine migration status.

115. Using passport data acquired as travellers cross the New Zealand border, a longitudinal travel history of almost every traveller is created. By applying a classification rule to these travel histories, the migrant status of any given border-crossing can be classified. In New Zealand, the particular classification method is called the '12/16-month rule'.

116. For example, an arrival who has been out of the country for at least 12 months in the 16 months prior to their border-crossing, is classified as a migrant arrival if they spend 12 months or more in New Zealand over the 16 months following the border-crossing. This method estimates migration more accurately, as we are no longer reliant on travellers' self-reported intentions.

117. Both measures are based around the United Nations guidelines about the length of time to use in determining the geography of usual residence. Because the measurements do not use any legal definition of residency, or indeed, migration in these estimates, arrivals and departures of all travellers qualifying under the time-based classification, including departing and returning New Zealand citizens, are captured.

118. The introduction of the new measure also allowed New Zealand to remove its departing passenger cards, with some data loss. However, the arrival cards continue to be

collected, and they are a valuable source of attribute information about both short-term travellers, and migrant arrivals.

119. The information available in the administrative data allow us to measure the flows by different variables such as age; sex; citizenship; visa upon entry; country of residence prior to arrival in New Zealand; and area of residence in New Zealand, among others.

1. Challenges of creating a history for each traveller

120. As with any administrative data, identity resolution is a challenge, especially given the number of border-crossings that we must resolve. Currently, our longitudinal administrative dataset extends back to 2013, with over 75 million border-crossings that require identity resolution to ascertain border-crossings by the same traveller. On average, about 40,000 border-crossings are added each day to this dataset. Within these border-crossings, we estimate over 17 million unique travellers, based on data available on passport records since 2013. The resolution of these individuals provides the basis of the longitudinal history of travellers.

2. Predictive modelling of migration flows for timely estimates

121. While the outcomes-based measure provides more accurate measures of migration, it requires a wait of 16 months before migration levels are known with certainty. To maintain timeliness with the 12/16 method, we have recently developed a predictive classification model – utilizing machine-learning applied at a unit record level to all border-crossings – which provides provisional estimates of migration for the latest 16 months.

122. This is a difficult prediction problem because there is a large class imbalance between overall traveller numbers and migrants (who make up less than 2 per cent of all border-crossings). We have employed a machine learning approach, learning at the unit record level, combined with a multiple imputation prediction method, also at a unit record level, to produce migration statistics with associated uncertainties. These new migration estimates are revised each month to include the latest information.

123. Estimation at unit record level is beneficial as it allows us to build up any required aggregations. Importantly, it also allows the model to easily run across linked administrative datasets, thus amplifying the utility of the estimates. This means we can then estimate migration patterns of a subset of people with a given set of attributes available in the linkable administrative data.

3. Benefits and challenges of switching to an outcomes base measure

124. The New Zealand outcome-based external migration measures are a combination of deterministically calculated migration estimates and modelled estimates with associated uncertainty measures. Switching to modelled migration estimates for the most recent periods (and away from intentions-based measures) replaces a perceived precise, but potentially biased measure, with a more variable measure where the uncertainties can be defined transparently. From an end-user perspective, this is a big change, especially dealing with substantial revisions for the most recent month when uncertainty is greatest. This requires careful interpretation and experimentation around the modelling methodology to explain internal model behaviour and build user confidence. However, these approaches prepare us for a world where increasingly administrative data, and models that sit atop such datasets, will be required for demographic estimation, and projection.

(d) Estimating migration flows using multiple censuses

125. It is possible to estimate the intercensal net migration by comparing the population estimates derived from two censuses, after accounting for natural population change (births and deaths). This method provides robust measures of aggregate subnational migration (a combination of external and internal migration) by demographic variables such as age and sex. Such measures are not always available from the administrative flow data.

126. However, this method does not provide any information on the arrival and departure flows. Nor does it provide the same attributes as collected by the border-crossing data above.

127. Examining the intercensal discrepancy at an aggregate level does provide valuable insight into the possible short-comings of the more "real-time" migration measures. As discussed above, the move away from an intentions-based measure, towards an outcomes-based measure was initiated by insights gained from this type of intercensal analysis.

128. In addition, linking census data across censuses at a unit record level provides a rich array of attribute information about the individuals and families that have arrived in the country since the last census. While this is possible, there are practical problems with linking, especially where the captured linking information may not track across the past censuses, especially older, primarily paper-based ones.

(e) Supplementary measurements about migrants

129. New Zealand does not conduct surveys specifically aimed at migrants as part of its official statistical system. However, some household surveys ask respondents about their place of birth, which allows for incidental analysis of migrant outcomes and wellbeing.

130. Surveys such as the General Social Survey (GSS), and the Household Labour Force Survey (HLFS) provides insights into a variety of dimensions across the population, ranging from perceived safety, to the labour participation and employment rates. Because migrants are captured in these surveys, as part of the general population of New Zealand, it is possible to gain insights into the lives of migrants based on them.

131. It should be noted that this data would not provide a full picture of migrant lives, as the construction of sampling frames do not take into account migrant population distributions within New Zealand (both geographically, and demographically).

132. In 2019 New Zealand released a comprehensive wellbeing measure based on more than 100 indicators. As with the surveys above, they will capture migrant wellbeing as part of the New Zealand population. For information about this measure can be found at the Indicators Aotearoa webpage.

1. Historical surveys on migration in New Zealand

133. New Zealand has conducted directed surveys on migration in the past. The latest of which was in 2009.

134. The Survey of Dynamics and Motivations for Migrants in New Zealand was run as an appended supplement to the HLFS in the March 2007 quarter. This survey investigated the reasons why people had moved, or not moved, within New Zealand or had arrived in New Zealand within the previous two years. The survey also asked about intentions to move

in the future. The survey was based on similar surveys carried out in Scandinavia and enabled broad demographic characteristics of mobility to be investigated. The survey provides a snapshot of drivers behind population mobility at the time, and, while this has not been repeated yet, there is growing interest in repeating this unique (for New Zealand) information source.

135. The Longitudinal Immigration Survey: New Zealand was a longitudinal survey run across three waves. This survey collected information on how well international immigrants settled, socially and economically, during their first three years as permanent residents in New Zealand, at 6, 18 and 36 months after grant of permanent residence. LISNZ provided detailed information on the nature and timing of outcomes key to the formulation of policy. The first wave of interviews took place across May 2005-May 2007, with the third wave running November 2007 to November 2009. Canada and Australia ran similar surveys at a similar time.

D. Case Study: United Kingdom

(a) Censuses

136. The UK censuses are run by the Northern Ireland Statistics & Research Agency (NISRA), National Records of Scotland (NRS), and the Office for National Statistics (ONS) for both England and Wales. The UK comprises the countries of England, Wales, Scotland and Northern Ireland. ONS is responsible for disseminating census statistics for the UK.

137. UK censuses ask questions about people and households. In doing so, they help build a detailed snapshot of UK society. Information from the census helps the government and local authorities to plan and fund local services, such as education, doctors' surgeries and roads.

138. In December 2018 the UK Government published a White Paper setting out proposals for the 2021 Census in England and Wales (HM Government (2018) 'Help Shape Our Future')[22]. Arrangements for the conduct of the censuses in Scotland and Northern Ireland will in all cases be subject to the consideration of the respective devolved administrations; proposals have been published by NRS and NISRA. At the time of writing, preparations are underway for the 2019 Rehearsal which is an end-to-end collection process in five Local Authorities.

139. The 2019 Rehearsal paper questionnaire[23] gives an indication of the format of migration and citizenship questions included in the 2011 Census and proposed for 2021. As part of the drive to optimise, the form for online completion there may be modest differences in the precise wording of questions in the electronic questionnaire.

140. Table 1 gives an overview of what topics were collected across the UK in 2011, where this differed and what the current proposals are for 2021 (it should be noted that these are only indicative of the current views across the UK). A number of topics were either new

[22] Detailed documentation in:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765089/Census2021WhitePaper.pdf
[23] Detailed documentation in:
https://census.gov.uk/H1_2019_v1-2_SPECIMEN.pdf

or re-included for the 2011 Census; these included those on date of arrival, intention to stay and passports held.

Table 1

2011 and proposed 2021 Census questions on migration and citizenship topics – collection across the UK

2011 Census Question	2011			Proposals for 2021		
	England and Wales	**Northern Ireland**	**Scotland**	England and Wales	Northern Ireland	Scotland
Country of birth	Collected	Collected	Collected	Proposed	Proposed	'Taking forward'
Date of arrival	Collected	Collected[1]	Collected	Proposed	Proposed	'Taking forward'
Intention to stay	Collected	Collected	Not collected	Proposed	Not proposed	'Not taking forward'
Passports held	Collected	Collected	Not collected	Proposed	Proposed	'Taking forward'
Address one year ago	Collected	Collected	Collected	Proposed	Proposed	'Taking forward'

2011: In addition to the topics above Northern Ireland collected information on if individuals have lived outside Northern Ireland for a continuous period of one year or more, the last country they lived in during the time outside Northern Ireland.

[1]2011: In Northern Ireland the question asked about the date of arrival in Northern Ireland, not the UK.

141. There is no single way to define and identify an international migrant. This is also true when considering the usually resident population on census day. In the 2011 Census, there were three ways in which an international migrant could be defined:

- A person who was born outside the UK, and therefore has migrated to the UK at some point in the past. However, while some people born abroad will have migrated recently, others will have lived in the UK for many years. Moreover, some people born abroad will be UK citizens, either because their parents were UK citizens overseas at the time of their birth, or because they have been granted UK citizenship since arriving;
- A person who holds a non-UK passport (taken to indicate a non-UK national). Again, while some non-UK nationals will have migrated to the UK recently, others will have lived in the UK for many years. Some people may hold two or more passports; these may be from non-EU countries, EU countries or a combination of both. Note that this information was not collected in Scotland;
- A person who was usually resident outside the UK one year prior to census day, indicating that they have migrated to the UK in the year up to 27 March 2011 (census day). This definition therefore excludes any international migrants who arrived in the UK prior to 28 March 2010 and would have included some people who are UK-born or UK nationals.

(b) Integration of Surveys and other data sources

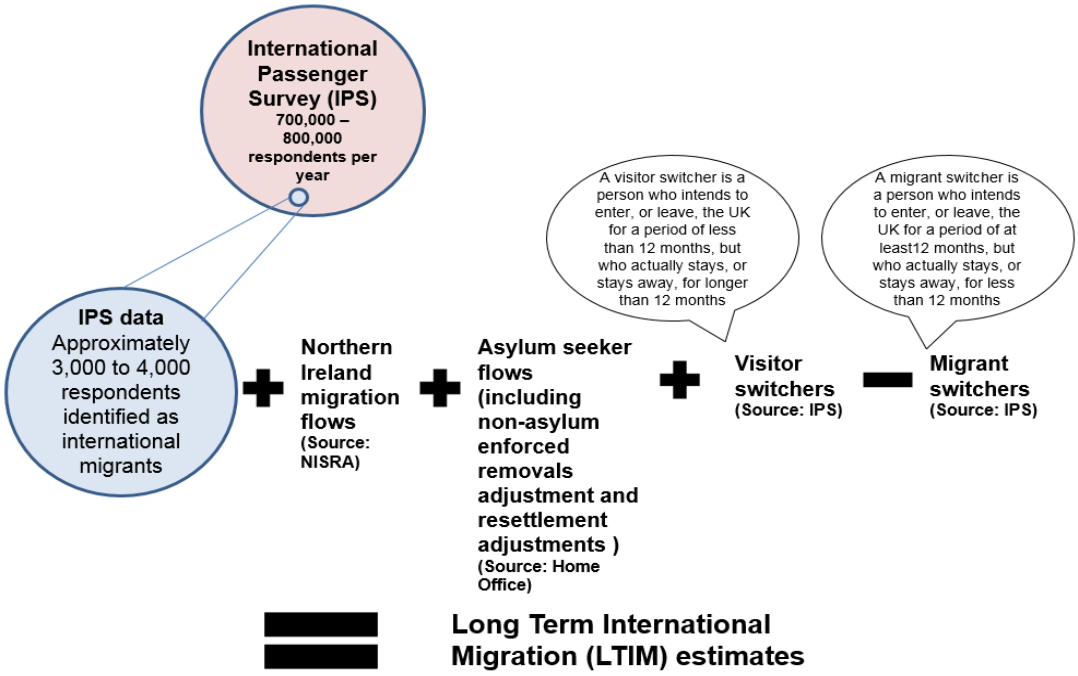
142. There is no single source that can provide a measure of all movements of people into and out of the UK. We currently use a combination of data from different sources to calculate

our official UK Long-Term International Migration (LTIM) estimates, which are published every quarter in the Migration Statistics Quarterly Report[24].

143. Estimates of LTIM are about 90% based on data from the International Passenger Survey (IPS)[25], a sample survey carried out at all main UK ports. The IPS captures migration intentions and is used to identify international migrants entering and leaving the UK.

144. To estimate LTIM, the IPS data are supplemented by Home Office and Northern Ireland Statistics and Research Agency (NISRA) data and several adjustments are made to provide a more complete estimate of migration (Figure 1).

Figure 1
Estimating Long-Term International Migration



Source: Office for National Statistics

This diagram represents the process before the preliminary adjustments were applied in August 2019.

145. National estimates of short-term international migration are produced directly from data from the International Passenger Survey (IPS) and published annually in the Short-Term International Migration (STIM) for England and Wales bulletin[26] .Estimates of STIM are produced for England and Wales and for local authorities.

[24] Detailed documentation in:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/migrationstatisticsquarterlyreport/previousReleases
[25] Detailed documentation in:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/methodologies/internationalpassengersurveyqualityinformationinrelationtomigrationflows
[26] Detailed documentation in:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/shortterminternationalmigrationannualreport/previousReleases

146. Estimates of short-term migration are available as flows (the total number of moves made over a set period) and stocks (the average number of short-term migrants in the country on an average day in a 12-month period). It should be noted that a person could migrate more than once in the same period so the data are a count of migrant moves not individuals.

(c) Administrative Data

147. As well as the official statistics on long- and short-term international migration which are based largely on the International Passenger Survey (IPS), there are also administrative datasets, which can provide information and often more detail on specific sub-groups of the population.

148. The Home Office Immigration statistics quarterly release[27] provides data on visas, asylum seekers, voluntary and enforced removals, resettlement schemes and grants of citizenship.

149. Department for Work and Pensions provides data on the number of National Insurance number (NINo) allocations to adult overseas nationals entering the UK[28].

150. The ONS also publish data on UK residents by country of birth and nationality[29] as reported in the Annual Population Survey (APS). Residents may have recently arrived or been resident in the UK for a number of years and are a count of the stock of the non-UK population.

(d) Data integration using administrative data

151. The current UK population system is heavily reliant on the decennial census. While this provides granular data at the lowest levels of geography every 10 years, it delivers less detail throughout the interim years. Additionally, the quality of our population estimates decline as we move further away from the census year. For England and Wales, transforming this system to one led by administrative data offers the opportunity to provide more frequent statistics and new analysis that better meet user needs, as set out in our previous work on the Administrative Data Census[30] project.

152. A rapidly changing policy context – including the government's plans for a new immigration system[31] once the UK exits the European Union – offers us a well-timed opportunity to reflect on the best way to deliver the population and migration statistics system to best meet user needs. Enabled by data-sharing powers in the Digital Economy Act 2017, we have the opportunity to make use of more data. This is essential to better understand

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[27] Detailed documentation in:
https://www.gov.uk/government/collections/immigration-statistics-quarterly-release
[28] Detailed documentation in:
https://www.gov.uk/government/collections/national-insurance-number-allocations-to-adult-overseas-nationals-entering-the-uk
[29] Detailed documentation in:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/ukpopulationbycountryofbirthandnationality/latest
[30] Detailed documentation in:
https://www.ons.gov.uk/census/censustransformationprogramme/administrativedatacensusproject/administrativedatacensusannualassessments/annualassessmentofonssprogressontheadministrativedatacensusjuly2018
[31] Detailed documentation in:
https://www.gov.uk/government/publications/the-uks-future-skills-based-immigration-system

our fast-changing population at both national and local levels, and the wider policy impact and context.

153. Working in partnership across the Government Statistical Service (GSS), this transformation work brings together what we have previously published through both the Office for National Statistics (ONS) Administrative Data Census[32] project and the cross-GSS Migration Statistics Transformation Programme[33].

154. Our aim is to bring together multiple sources of data to build a comprehensive and granular evidence base for migration to (and eventually from) the UK. This approach involves several steps:

- understanding who are potential long-term immigrants (usual residents) using variables from health, education, and revenue and tax administrative data;
- we then look across longitudinally linked data sources to assess how different types of migrants interact with these systems over time and what that tells us about how long they stay in the UK;
- build our understanding on the way different types of migrants interact with various data sources by linking these data sources together; we have already carried out further exploration of how we can use Higher Education and Home Office administrative data to better understand international student migration in particular.

155. Whilst the UN current concepts and definitions cover a range of important information on population and migration, they are not comprehensive. People's lives are complex, as illustrated by our previous research[34] on what Home Office administrative data can tell us about travel patterns into and out of the UK.

156. In the future, we need a flexible approach that enables us to produce estimates of the population relating to the standard usually resident definition, but also other bases of the population, for example, the daytime population, to understand the impact that the increasingly more mobile population has on different services. Similarly, migrants enter and leave the UK for a variety of reasons, stay for different lengths of time and interact with society and the economy in different ways. We therefore believe that additional or alternative definitions may be needed to better reflect this complexity.

157. An important example of this is circular migration, which is not covered by the statistics that ONS currently publishes. ONS have taken forward research [35] to better understand these patterns – using Home Office administrative data on non-European Economic Area (non-EEA) nationals who held, or went on to hold, a non-visit visa. This is

[32] Detailed documentation in:
https://www.ons.gov.uk/census/censustransformationprogramme/administrativedatacensusproject/administrativedatacensusannualassessments/annualassessmentofonssprogressontheadministrativedatacensusjuly2018
[33] Detailed documentation in:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/articles/migrationstatisticstransformationupdate/2018-05-24
[34] Detailed documentation in:
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/articles/reportonthecomplexityandqualityofinternationalmigrationstatistics/july2018
[35] Detailed documentation in:
https://www.slideshare.net/statisticsONS/transforming-population-and-migration-statistics-patterns-of-circular-movement-into-the-uk-129834145

important as it helps assess whether people are included in the correct definitions of migrants or visitors, consider whether these existing definitions should be maintained or amended, and identify whether any further categories are needed to reflect the complexity of people's travel patterns.

158. We have long acknowledged that the International Passenger Survey (IPS), which underpins our existing international migration estimates[36], has been stretched beyond its original purpose and that we need to consider all available sources to fully understand international migration. Additionally, there is no single, comprehensive data source that tells us everything about the population. Therefore, our approach focuses on identifying the strengths of individual data sources, integrating them to give us a much richer understanding of how our population is changing.

159. However, the IPS will continue to have a role in ensuring our estimates of international migration remain timely. Administrative sources are often retrospective, that is, they tell us about activity that has already happened. There may be notable time lags before we can use these sources to identify new arrivals to the UK – as people may not register for public services such as health care immediately and consequently, will not be present in the administrative data until they do. We may also need to wait to ensure that new arrivals or departures have been active or inactive in the data sources for long enough to be considered a long-term migrant (as stated in the UN definition)[37].

160. The IPS will therefore continue to be essential as a leading indicator of international migration. The survey collects information on the future intentions of individuals moving to the UK and helps provide a timely picture of migration patterns. We can then potentially enhance it using the latest administrative sources, so that we reach our best assessment of migration – reflecting the strengths of what different sources can tell us.

VI. CHALLENGES TO MEASURE INTERNATIONAL MIGRATION AND CROSS-BORDER MOBILITY

161. One of the challenges is to achieve an adequate design to capture the **concepts of usual residence, migration and daily mobility**, taking into consideration how the population understands the concept of habitual residence and when it constitutes a change of residence due to work or study.

162. It is necessary to incorporate the criteria of residence time and the intention of the migration movement to capture information from the migrant population in the population censuses, since the only criterion is currently the place of habitual residence five years before enumeration.

163. Standardize concepts among the nations that make up regional systems of migration, transit migration or border life. For example, conceptual references of the United States Census Bureau define migration from the place of residence one year before[38], while in

[36] Detailed documentation in:https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/migrationstatisticsquarterlyreport/previousReleases

[37] Detailed documentation: https://unstats.un.org/unsd/publication/SeriesM/SeriesM_58rev1e.pdf

[38] US Census Bureau. American Community Survey and Puerto Rico Community Survey

Mexico it is defined from the place of residence five years before. In the case of Guatemala, it is not even possible to know the definition of migration that was considered in the 2017-2018 Census[39].

164. The compilation and integration of data on international migrants and frontier workers should provide information on the main socio-demographic characteristics of international migrants[40] and the employment status of frontier workers:

(a) Sociodemographic characteristics of international migrants that should be included: size of the migrant population; sex; age; the location of residence of migrant groups in the host country; the language that migrants speak and on knowledge and proficiency in host country language; demographic characteristics, such as mortality, fertility, marital status; its educational characteristics: school attendance; highest level of education attained; country of habitual residence; migration objective; its link to the labour market activities; main reason for the last departure from the country; type of immigration documents; length of stay; permanent, temporary or circular nature of migration; migratory past; family relationships and characteristics of family group members[41];

(b) Characteristics of the labour force that must be available: status of employed or unemployed; branch of economic activity; profession; occupation or office performed, position in occupation; work time, type of work contract; duration of occupation; income related to the occupation; remittances sent out of the country of connection to the labour market; social security benefits in the country linked to the labour market; occupational injuries, participation in the formal or informal employment sector; labour exploitation and forced labour of international migrant workers;

(c) The concepts and categories of the elements used in data collection should be adapted or converted to the most recent international statistical standards, if any, such as the Recommendations on International Migration Statistics, the International Standard Classification of Education (ISCED), the International Standard Industrial Classification of all economic activities (ISIC), the International Standard Classification of Occupations (ISCO), the International Classification of Occupational Situation (CISO), and the ICLS standards on labour statistics, the occupation and underutilization of the labour force, work time and income related to the occupation;

(d) The periodicity of the data collection depends on the statistical needs and the capacity of the statistical infrastructure of the country of measurement. The periodicity of the data collection may vary depending on the elements used for the collection, but the minimum periodicity necessary for the collection of the main indicators in the subject in question must be considered;

2014. Subject Definitions. Retrieved from: https://www2.census.gov/programs-surveys/acs/tech_docs/subject_definitions/2014_ACSSubjectDefinitions.pdf

[39] See: https://www.censopoblacion.gt/

[40] UNECE (2015). Measuring change in the socio-economic conditions of migrants. New York, Geneva: United Nations. Available at http://www.unece.org/index.php?id=40542.

[41] UNECE "Measuring change in the socio-economic conditions of migrants" (2015). United Nations, Retrieved from https://www.unece.org/fileadmin/DAM/stats/publications/2015/ECE_CES_42.pdf

(e) The process of integrating information from different sources is of vital importance to comply with the legal precepts on the handling of personal data, this entails a strict observance of the principles of confidentiality and reservation of the identification data of the population contained in the administrative records, which should only be used for statistical purposes.

165. The **information** on the different aspects of international labour migration and the categories of international migrant workers **can come from various statistics and sources**, for this they should be considered complementary and should be used to obtain new sets of statistics as far as possible from: population censuses; demographic surveys on the labour force; specialized in migration; surveys in areas near international borders or refugee camp surveys; censuses and surveys of establishments; as well as administrative records that generate statistics on migrant flows: border records; residence and work permits issued; issued visas; foreigner records; tax and social security records.

166. Information on the different aspects of international labour migration and the categories of international migrant workers can come from various sources that can generate statistics on flows and populations: population registries, foreigners' registries; residence permit records issued, work permits issued; issued visas, tax records, social security, records of public services (such as telephone or electricity); surveys in areas near international borders or surveys of refugee camps.

167. To take advantage of the information recorded by **new data sources** from mobile devices, social networks, satellite images and the use of Internet platforms to deepen knowledge of international migration and mobility, it is required to:

(a) Facilitate new forms of association between the public and private sectors to access data held by private or state-owned companies.

(b) Develop appropriate technological infrastructure for data management and processing and the development of security systems that allow permanent updating due to the rapid pace of change and technological innovation.

(c) Create work groups dedicated to researching the potential of new data sources (big data, machine learning) to develop the methodology that allows to analyse large volumes of data in an agile and efficient way, in order to extract their meaning of huge, complex data volumes and what sources can provide useful information to generate official statistics in the field of migration and human mobility.

(d) Establish a dialogue between policymakers, scientists, data providers and regulators, to actively address trust, privacy and ethical issues.

168. To develop the **methodology for integrating information from different data sources**, specific definitions and procedures must be developed to overcome the problems of measuring international labour migration and cross-border mobility. For this it is necessary:

(a) To develop methodological standards for data integration practices in national statistical offices, particularly to standardize concepts and operational definitions, and to reconcile the data, using various statistical techniques or by some other method;

(b) To develop instruments for the collection of data to capture and relate information on the immigration status and past and present employment status of people;

(c) To develop collection tools that allow data collection and matching of international migrant workers returning to their country of origin and of the corresponding labour situation in the country related to the labour market;

(d) To strengthen and develop the necessary methodology to integrate and relate the data of the migrant population that comes from two or more sources: administrative records, surveys, population censuses or economic establishments;

(e) To ensure that the statistical offices use transparent rules and methods in the data integration processes that are used to produce statistics on international migration flows, cross-border mobility and other types of international migration statistics;

(f) To establish the regulations and legal criteria on the handling of personal data, to safeguard the principles of confidentiality and reservation of identification data.

VII. CONCLUSIONS

169. **An integrated national statistical system on migration statistics and cross-border mobility should be developed** in consultation with the various users of the statistics and in coordination with the collection of other economic, demographic and social statistical data from censuses, surveys and administrative records. The concepts and topics examined and the different measurement or reporting frequencies will depend on their importance for each country as well as the available resources. Each country should establish an adequate strategy for data collection and statistical reporting that guarantees the improvement and comparability of statistics on international migration and cross-border mobility.

170. National statistical offices should seek to follow international norms, concepts, classifications or standards that are generated to capture international migration and cross-border mobility. At the same time, greater attention should be paid to the **evaluation of the quality of integrated data** as part of the process of producing statistics on international migration and cross-border mobility.

171. The biggest challenge is to **meet the growing demand for information on these issues**. Regarding the offer of census information, its frequency of once in ten years is insufficient in the context of rapid transformations of society. It is necessary to coordinate efforts to use specialized surveys that can provide more details on the events of migration and cross-border mobility and on the people involved. In turn, it is essential to design and develop a system of administrative records of the migrant population of neighbouring countries, which can be used to generate official statistics on the subject.

172. Likewise, progress must be made in the research processes to **establish guidelines and methodologies** for:

(a) better use of the data on international migration and cross-border mobility derived from traditional sources (population and housing censuses, surveys and administrative records);

(b) development of new methods and technologies to collect and process data captured by digital devices (mobile phones and Internet-based platforms: email, Google, Facebook, Twitter, etc.); and

(c) develop methodology necessary to relate data from different sources to generate official statistics in the field of migration and human mobility.

173. It is also considered necessary to **develop appropriate legal and regulatory frameworks** to safeguard the confidentiality of information, guarantee privacy and the ethical handling of data, and ensure that the data are not used for surveillance purposes, which is particularly relevant for irregular or illegal migration.

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