THE USE OF MOBILE POSITIONING DATA FOR OFFICIAL STATISTICS: INDONESIA'S EXPERIENCE

BADAN PUSAT STATISTIK

1 The Use of Mobile Positioning Data for Inbound Tourism

BACKGROUND

BPS rely on the Immigration Record and Border Survey for Inbound & Outbound Tourism Data

Visits from neighbouring countries only 7% of tourism

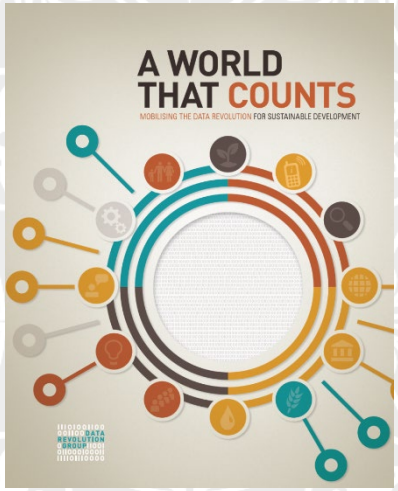
Under Coverage :

→ Not All Border Gates have 24/7 Immigration service

→ Not All Borders have border gates

→ Border Survey is too expensive and can not be done in all unattended gates (Cross Border Survey 2016 can only be done in 16 kabupatens)

ALIGNMENT WITH STRATEGY



In line with UN Recommendation "A World that Count"

Big Data
- Can be compiled automatically
- Real Time
- Less Manual Labour

Data Revolution For Sustainable Development

The integration of these new data with traditional data to produce high-quality information that is more detailed, timely, and relevant for many purposes and users, especially to foster and monitor sustainable development.

MPD as one of the Most Promising ICT Data Sources

To measure the mobility of people, including mobility of tourists. The digital footprint left by the users is very sensitive, but also highly valuable, as it provides new possibilities to measure and monitor the spatio-temporal activities of the population.

THE MPD USE IN INBOUND TOURISM

- BPS implemented MPD since October 2016
- The MPD used is signalling data
- Data provided by MNO → aggregate table (data quality?, QAF?)
- Oct-Des 2016 : MPD was applied to 19 districts,
  since January 2017 became 25 districts.
- Filtering and Calibrations is improved 3 times
- Methodology is improved once

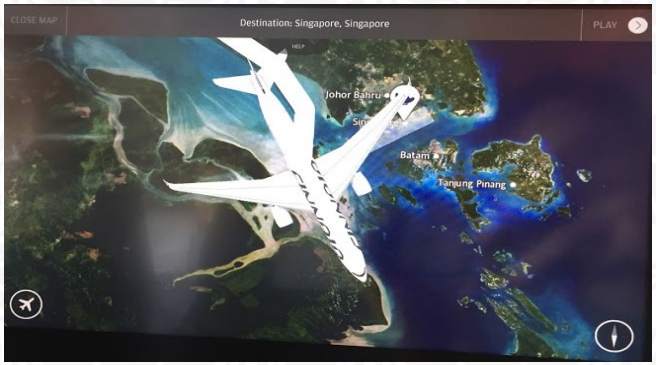
SIGNALING DATA ADDS NOISE

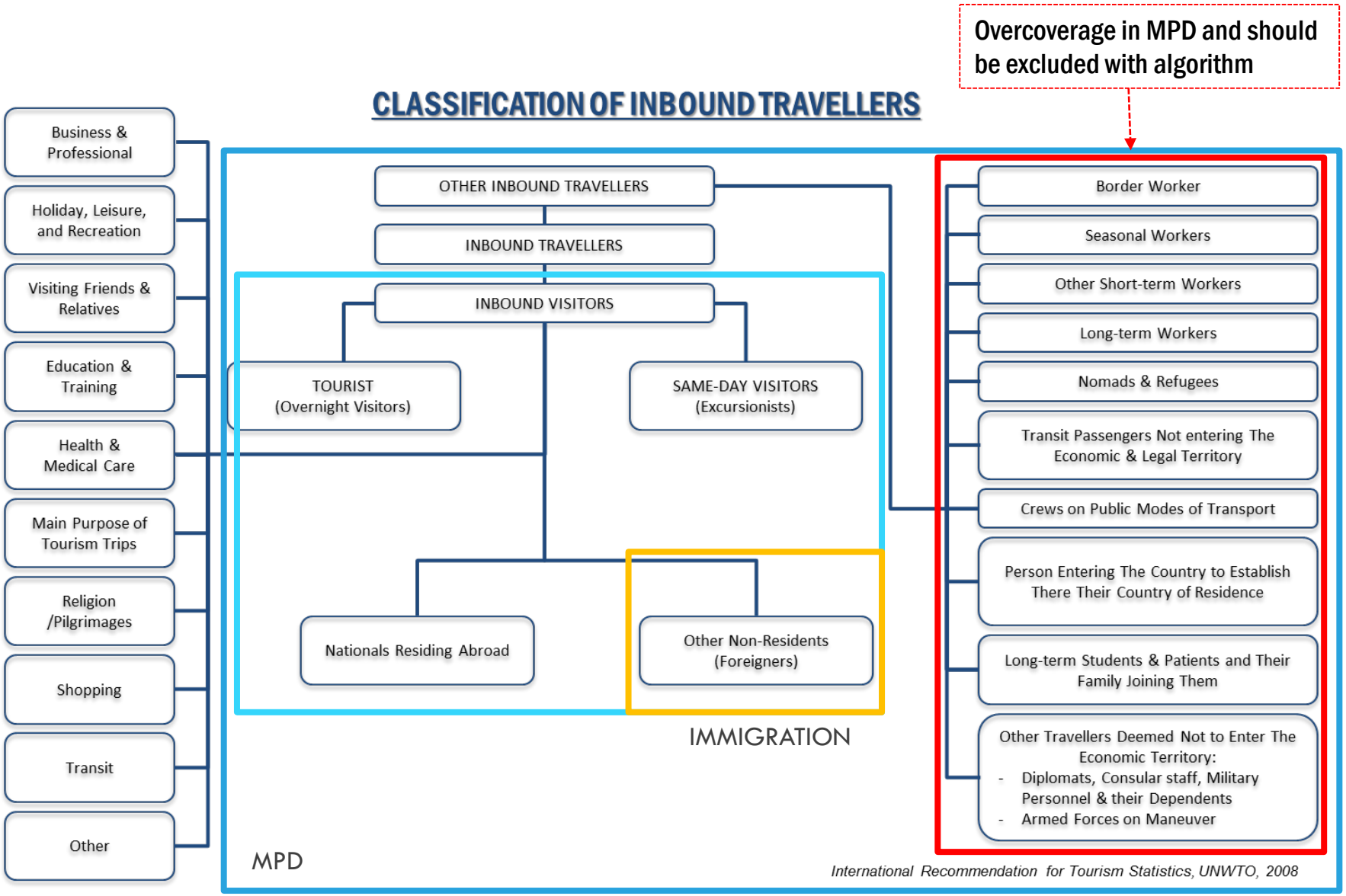
Mobile Positioning Data

- Signaling – all signals of mobile phones captured by the BTS (mobile antenna), even with no call/text
- CDR – records of active use of mobile phones

Statistical and Non Statistical Noises

- Fast fliers
- Seamen
- Accidental roamers
- Other transit




Overcoverage in MPD and should be excluded with algorithm
CLASSIFICATION OF INBOUND TRAVELLERS
Business & Professional
Holiday, Leisure, and Recreation
Visiting Friends & Relatives
Education & Training
Health & Medical Care
Main Purpose of Tourism Trips
Religion /Pilgrimages
Shopping
Transit
Other
OTHER INBOUND TRAVELLERS
INBOUND TRAVELLERS
INBOUND VISITORS
TOURIST (Overnight Visitors)
SAME-DAY VISITORS (Excursionists)
Nationals Residing Abroad
Other Non-Residents (Foreigners)
IMMIGRATION
Border Worker
Seasonal Workers
Other Short-term Workers
Long-term Workers
Nomads & Refugees
Transit Passengers Not entering The Economic & Legal Territory
Crews on Public Modes of Transport
Person Entering The Country to Establish There Their Country of Residence
Long-term Students & Patients and Their Family Joining Them
Other Travellers Deemed Not to Enter The Economic Territory:
- Diplomats, Consular staff, Military Personnel & their Dependents
- Armed Forces on Maneuver
MPD
International Recommendation for Tourism Statistics, UNWTO, 2008

FILTERING MPD AT BORDER GATES

$$AT = \left(\frac{MPD}{Xroam} \times \frac{1}{1 - Pnr} \times \frac{1}{MS} \right) - WCI$$

- AT : Additional Tourists based on MPD
- MPD : Number of sim card foreigner detected by MNO
- X_{roam} : Ratio sim card per mobile phone
- P_{nr} : Ratio of foreigner Non-roaming (using local sim card or no mobile phone)
- MS : Market share
- WCI : Inbound Tourism recorded by Immigration

CROSS-BORDER SURVEY

Cross Border Survey to obtain:

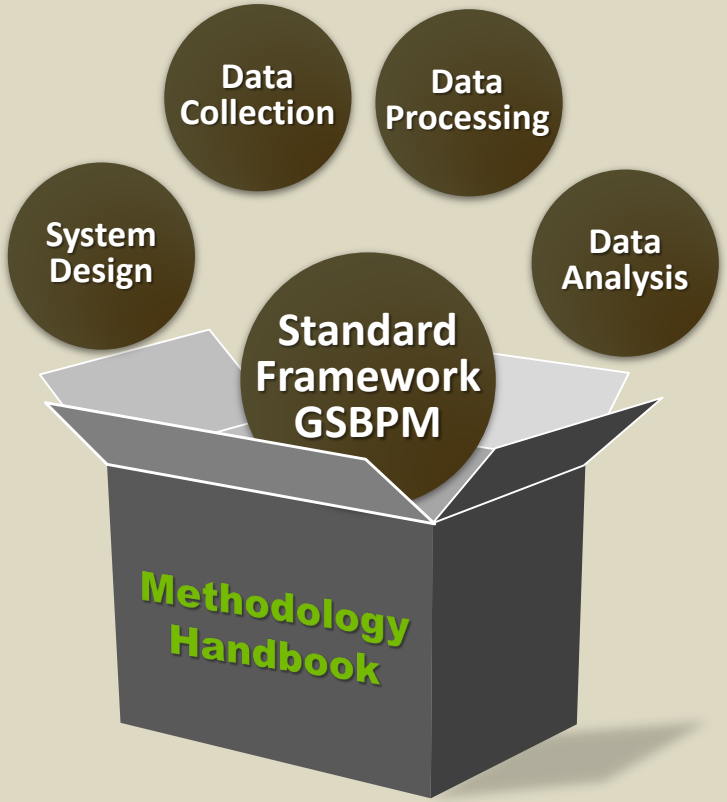
- Mobile phone Usage During Crossing Border
- Purpose of Travel
- Expenditure
- Main Occupation

Survey was conducted in 25 Kabupaten cover 76 gates, July & October 2017, samples= 36.000

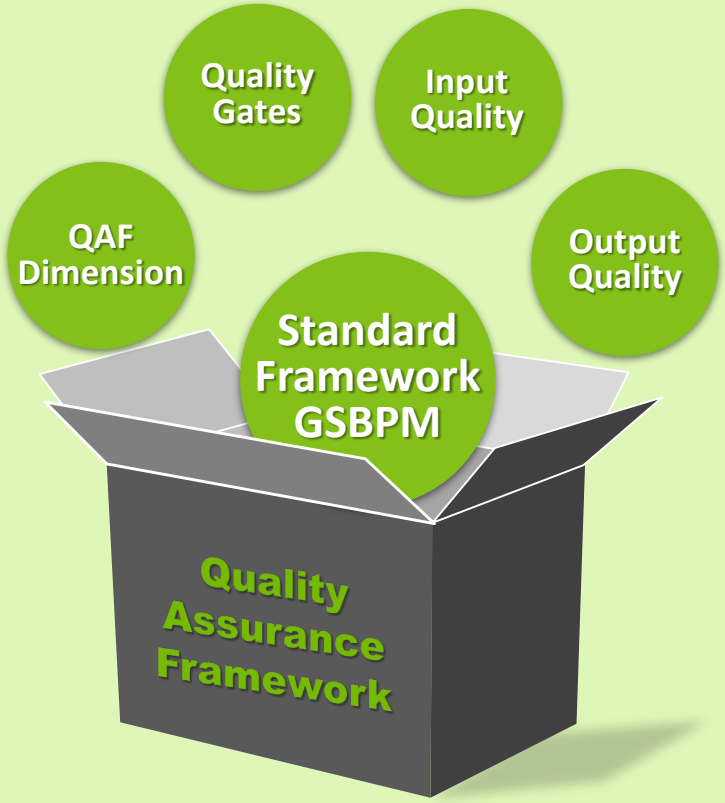
Methodology and QAF Handbook

Indonesia currently already has Methodology and QAF handbook for the use MPD in Cross Border Inbound Tourism

Methodology Handbook



QAF



BADAN PUSAT STATISTIK

2 The Use of Mobile Positioning Data for Domestic Tourism

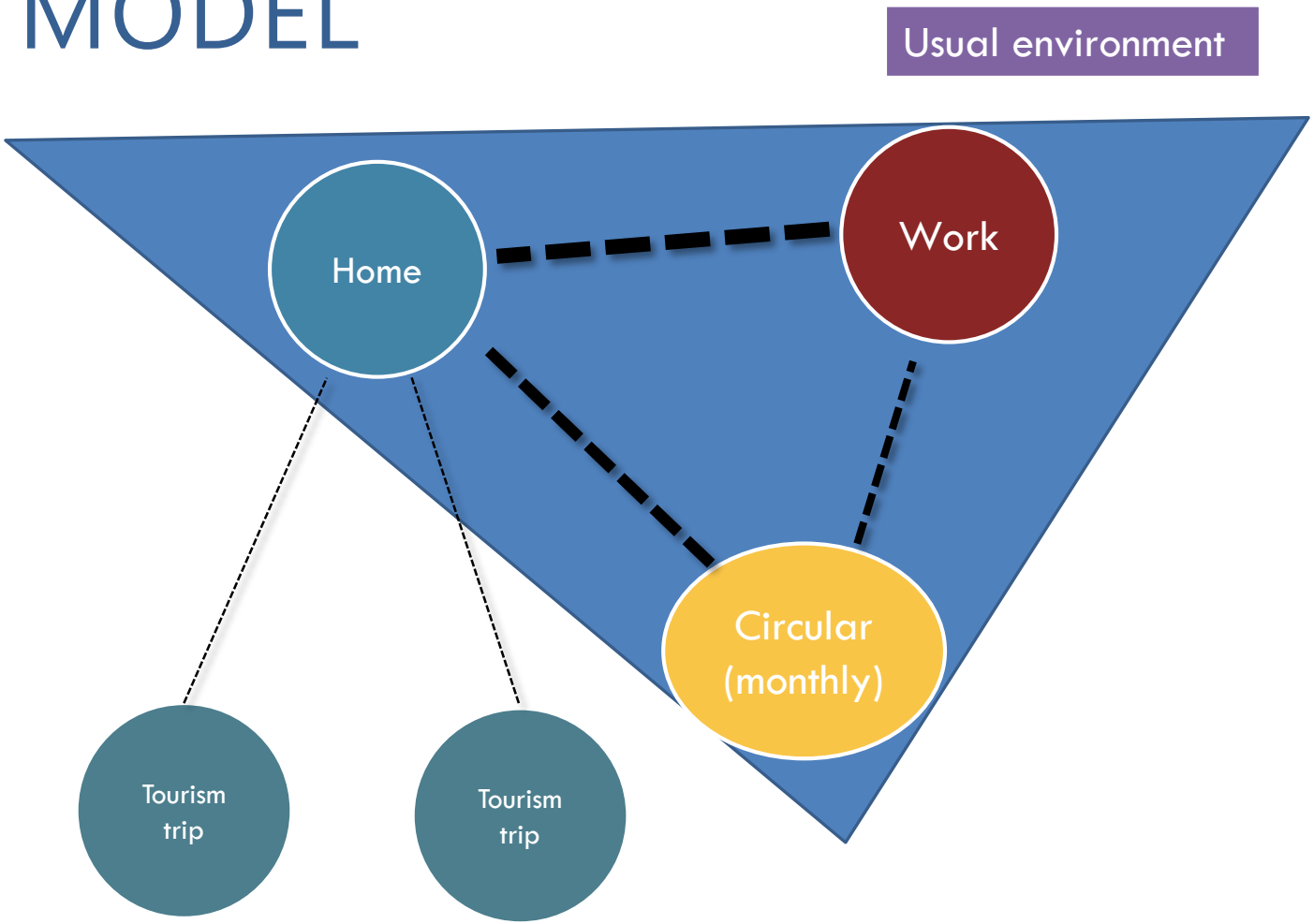
INTRODUCTION

- BPS-Statistics Indonesia never published domestic tourism data at Regency/City level due to sample sufficiency, expensive and huge work burden, while the data became more important and demanding by policy maker and business.
- Pilot in 2018 and 2019, compared household (conventional) survey for domestic tourism with Mobile Positioning Data and digital survey.
- Digital survey is conducted to overcome limitation of MPD such as no expenditure data, no motivation. Digital survey was conducted using selected sample indicated by Mobile Position Data
- BPS expects to substitute surveys with timely and more accurate digital data collection in the future (hopefully)

DOMESTIC TOURISM WITH *MOBILE POSITIONING DATA* (MPD) AND DIGITAL SURVEY (PILOT)

Coverage : 190 million subscribers, all Indonesia
Time reference : Monthly
Output : O-D Matrix of 514 kabupaten/city
Expenditure data : Digital survey 50.000 travellers
Estimation : Other MNO subscribers & non cellular user from conventional household survey

O-D MODEL



Source: Saluveer, E

BIG DATA TEAM - BPS

MOBILE PHONE FOOTPRINT FOR BPS VOLUNTEER NO 4

X__1	datetime	source	lat	long	propinsi	kabupaten	kecamatan	kelurahan	node
BPS4	20171202171409	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171202211454	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203011443	LBA_ALL	-6,24511	106,9055	DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU	2G
BPS4	20171203011443	LBA_ALL	-6,24511	106,9055	DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU	2G
BPS4	20171203011443	LBA_ALL	-6,24511	106,9055	DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU	2G
BPS4	20171203012058	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203012346	LBA_ALL	-6,24511	106,9055	DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU	2G
BPS4	20171203012346	LBA_ALL	-6,24511	106,9055	DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU	2G
BPS4	20171203012415	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203012415	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203052417	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203052417	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203092418	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203092433	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203102118	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203102118	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203103340	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203104540	LBA_ALL	-6,25032	106,9025	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203110019	LBA_ALL	-6,24511	106,9055	DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU	2G
BPS4	20171203132131	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203132131	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G
BPS4	20171203153719	LBA_ALL	-6,24839	106,9108	DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU	3G

BIG DATA TEAM - BPS

MOBILE PHONE FOOTPRINT FOR BPS VOLUNTEER NO 4

lat	long
-6,24839	106,9108
-6,24839	106,9108
-6,24511	106,9055
-6,24511	106,9055
-6,24511	106,9055
-6,24839	106,9108
-6,24511	106,9055
-6,24511	106,9055
-6,24839	106,9108

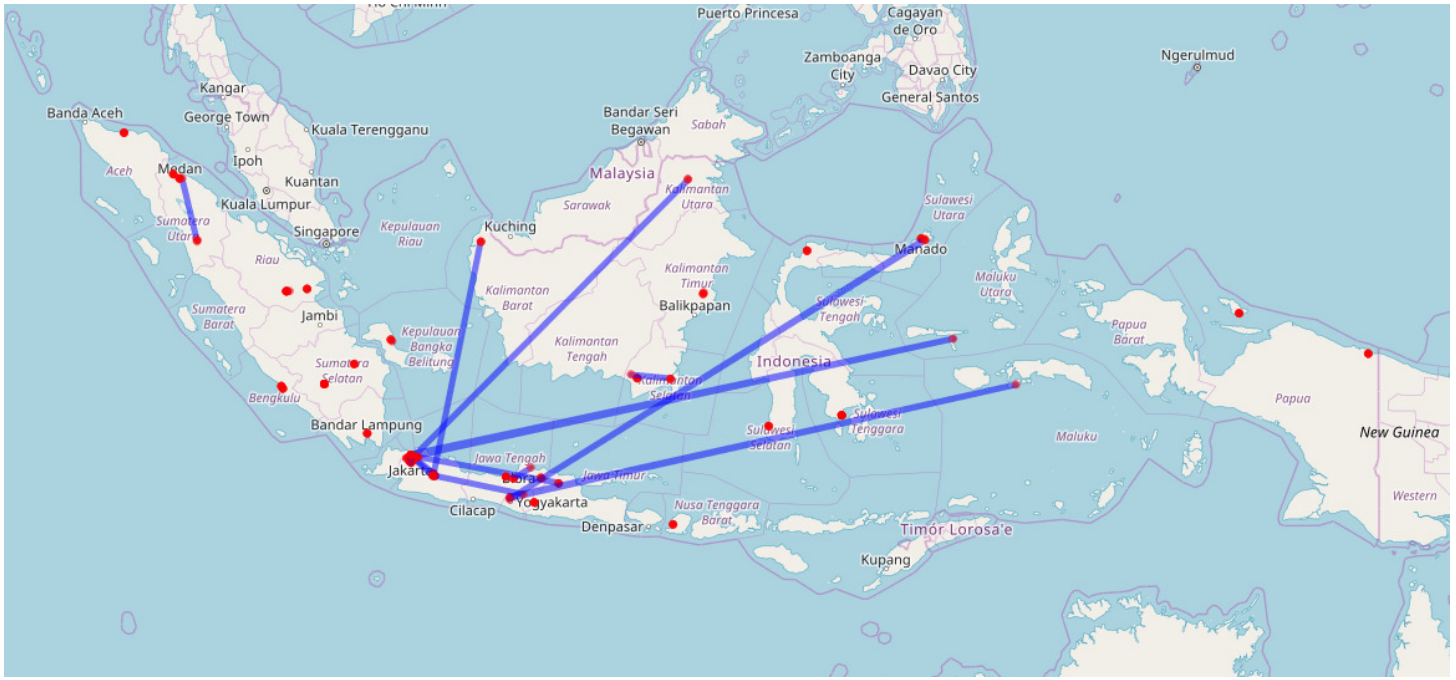
Using latitude longitude data, we can measure distances of origin and destination

propinsi	kabupaten	kecamatan	kelurahan
DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU
DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU
DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU
DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU
DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU
DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU
DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU
DKI JAKARTA	JAKARTA TIMUR	DUREN SAWIT	PONDOK BAMBU
DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU
DKI JAKARTA	JAKARTA TIMUR	MAKASAR	CIPINANG MELAYU

Using local administrative units (LAU), we can know the movements between regions.

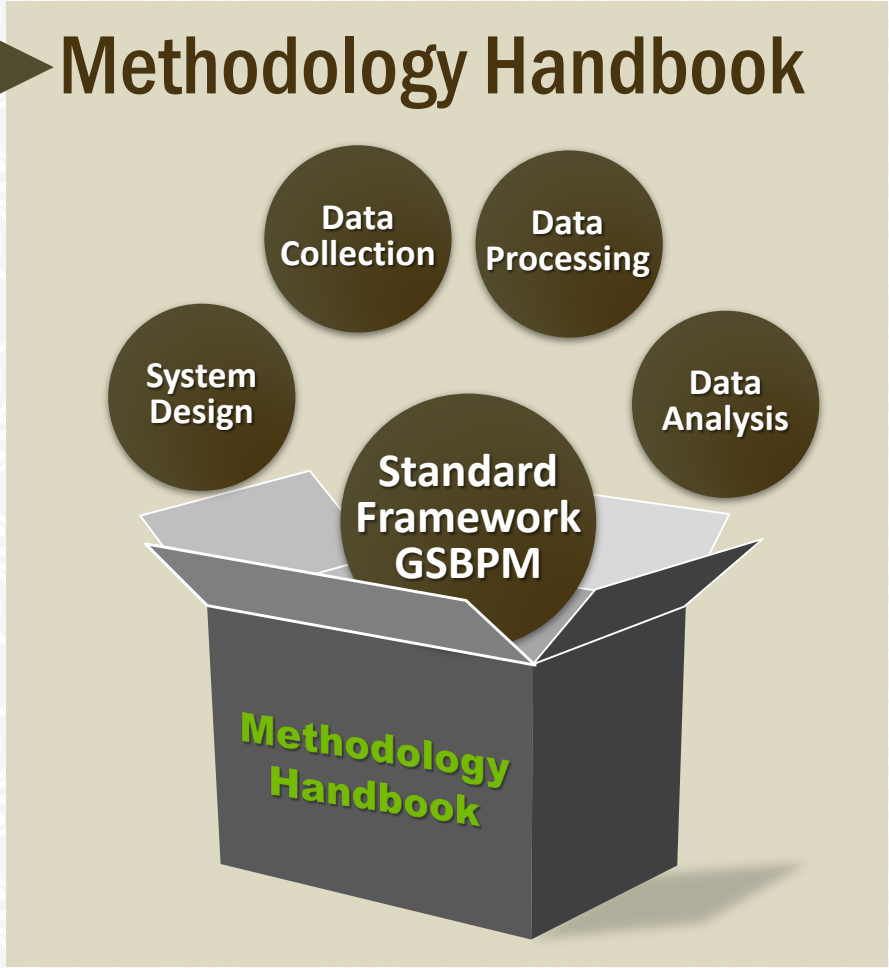
Using date and time, we can measure duration of the movements.

datetime
20171202171409
20171202211454
20171203011443
20171203011443
20171203011443
20171203012058
20171203012346
20171203012346


Puerto Princesa
Cagayan de Oro
Zamboanga City
Davao City
General Santos
Ngerulmud
Kangar
Banda Aceh
George Town
Kuala Terengganu
Bandar Seri Begawan
Sabah
Aceh
Medan
Ipoh
Kuantan
Malaysia
Kuala Lumpur
Sarawak
Kalimantan Utara
Sulawesi Utara
Sumatera Utara
Singapore
Kepulauan Riau
Kuching
Manado
Riau
Kalimantan Timur
Maluku Utara
Kalimantan Barat
Balikpapan
Sulawesi Tengah
Sumatera Barat
Jambi
Kepulauan Bangka Belitung
Papua Barat
Kalimantan Tengah
Indonesia
Sumatera Selatan
Bengkulu
Papua
Sulawesi Tenggara
Bandar Lampung
Maluku
New Guinea
Sulawesi Selatan
Jawa Tengah
Jakarta
Jawa Timur
Western
Yogyakarta
Nusa Tenggara Barat
Cilacap
Denpasar
Timor Lorosa'e
Kupang

Methodology Handbook

Indonesia currently already has draft of Methodology Handbook for the use MPD in Domestic Tourism

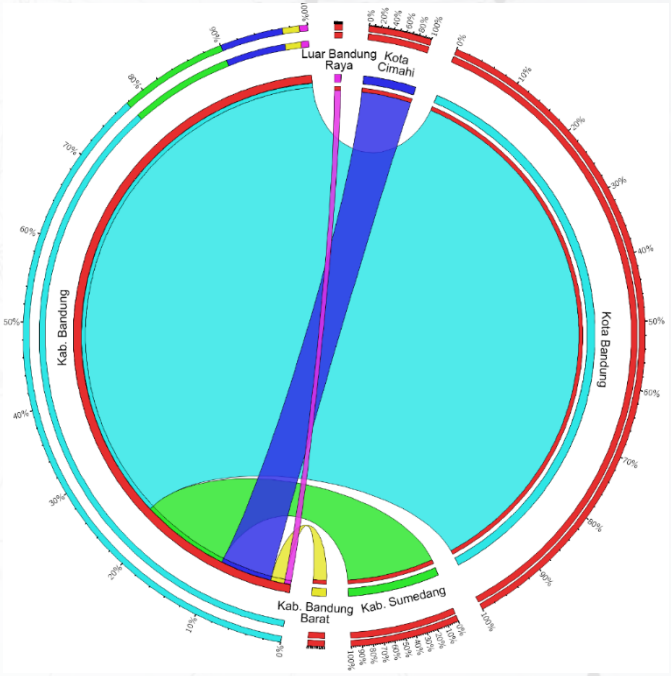


3 The Use of Mobile Positioning Data for Commuting

INTRODUCTION

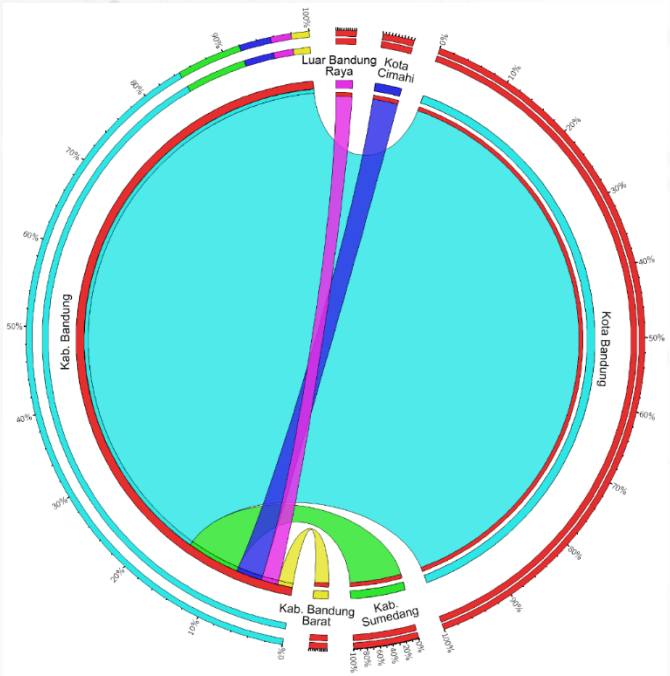
- Previously commuter data is obtained from survey (every two years at several cities)
- BPS-Statistics Indonesia plan to get commuter data more frequent, cover all kabupatens, obtain data up to kecamatan level and near real time.
- Commuters and circular travellers were the by product of domestic tourism MPD .
- MPD can gave data at small area even until venue (e.g GBK, JSC, Nusa Dua).

Commuter Estimation Comparasion using Survey vs MPD



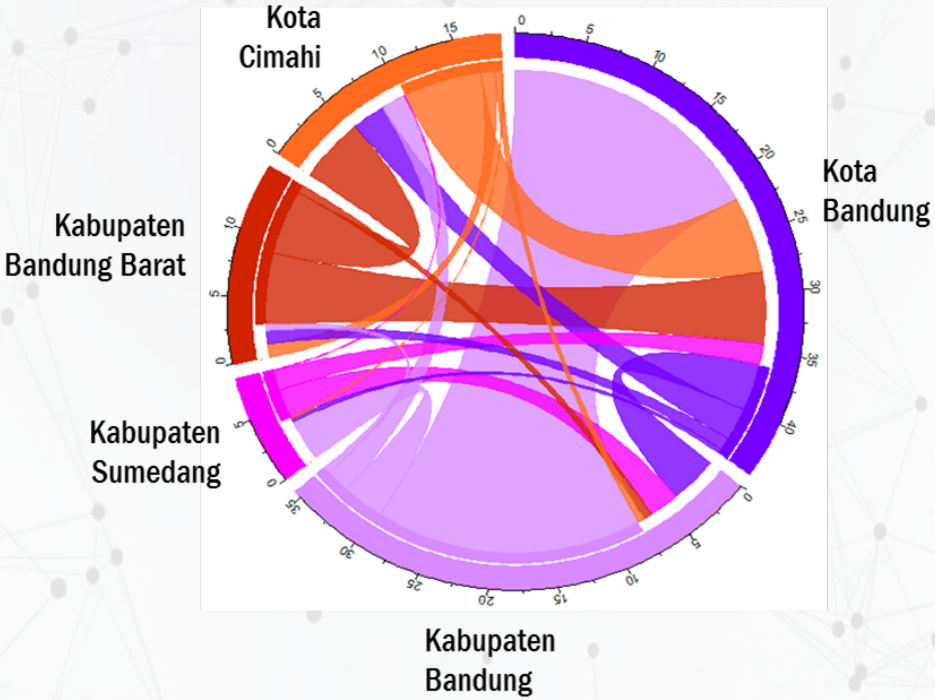
Commuter Survey

vs



MPD

Commuter Estimation Comparison using Survey vs MPD



BADAN PUSAT STATISTIK

4 The Use of Mobile Positioning Data for Event Analysis (Asian Games 2018 and AM WB-IMF)

INTRODUCTION

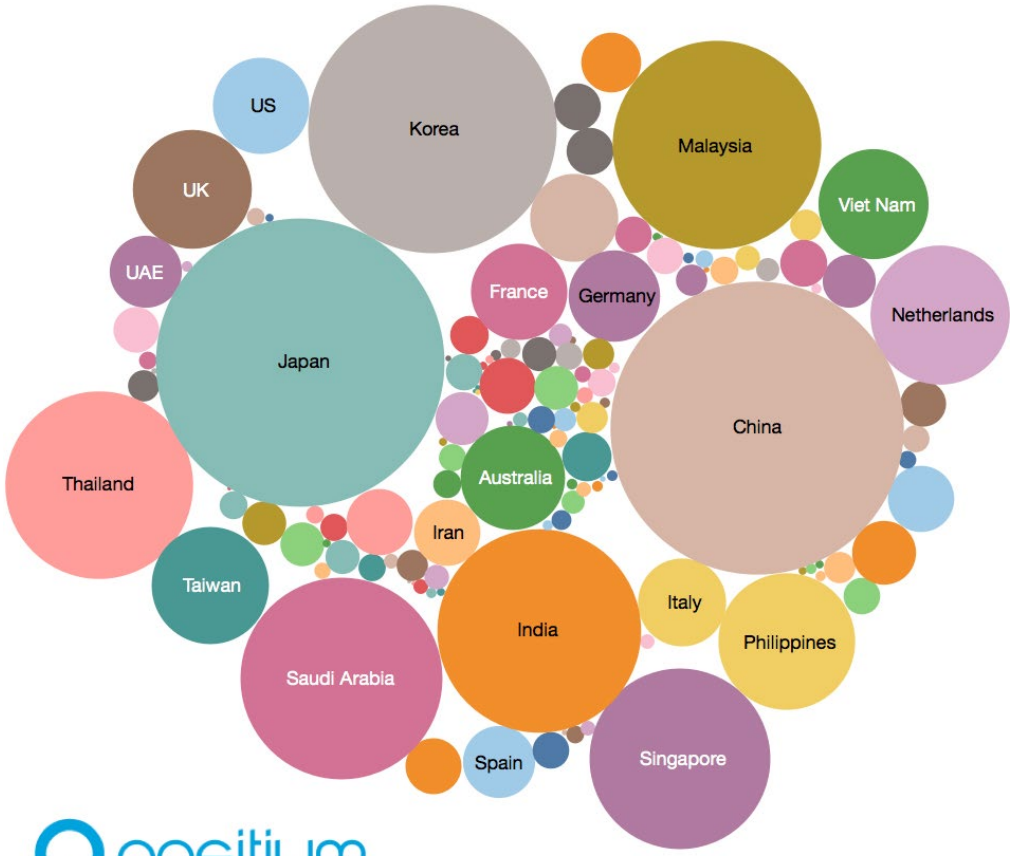
- The immigration data only gave inbound to Jakarta, Palembang and Denpasar
- MPD can gave data until venue (e.g GBK, JSC, Nusa Dua)
- The data then used for economic impact analysis (using Computable General Equilibrium/CGE model) and other analysis (destination analysis)

Asian Games attracted a lot of visitors, as evidenced by good ticket sales, but not many foreign tourists.

78 thousand is low compared to expected number of foreign visitors.

However, Asian countries posted good trends overall, with some exceptions.

Total number of Asian Games visitors from different countries



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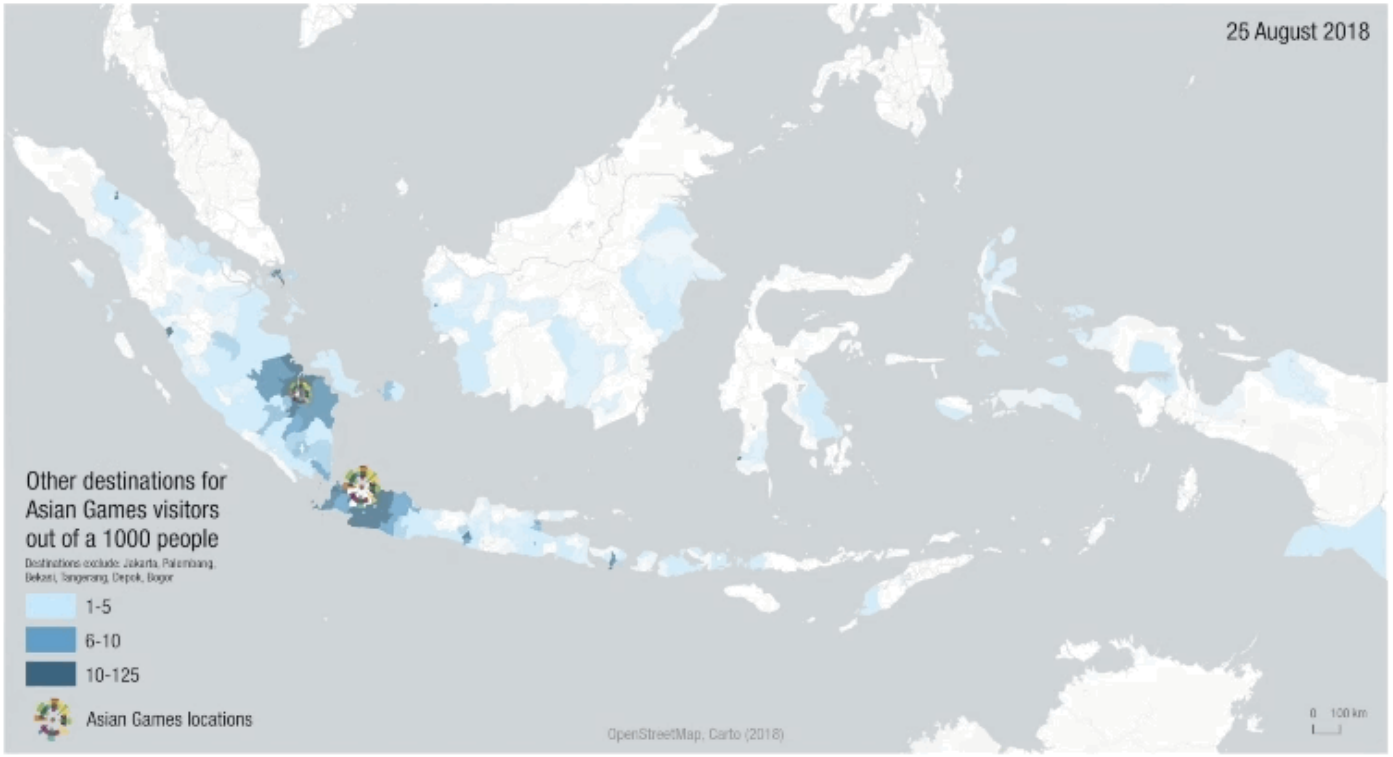

Other destinations visited
25 Aug – 8 Sept

THANK YOU