
Unlocking the Potential of Mobile Positioning Data: Collection, Processing, and Challenges

Tourism Case



On behalf of the Tourism Subgroup

Alfatihah Reno Maulani - Statistics Indonesia - alfa@bps.go.id

MPD FOR TOURISM

UN Committee of Experts on Big Data and Data Science for Official Statistics has prepared guiding materials for the use of mobile positioning data for **tourism statistics** for the statistical community

Task Team Member:

Indonesia, Georgia, Austria, KSA, Netherland, UnDESA, ITU, Positium

methodology for tourism, see:
<https://unstats.un.org/wiki/display/MPDTS>



Methodological guide on the use of mobile phone data: Tourism Statistics

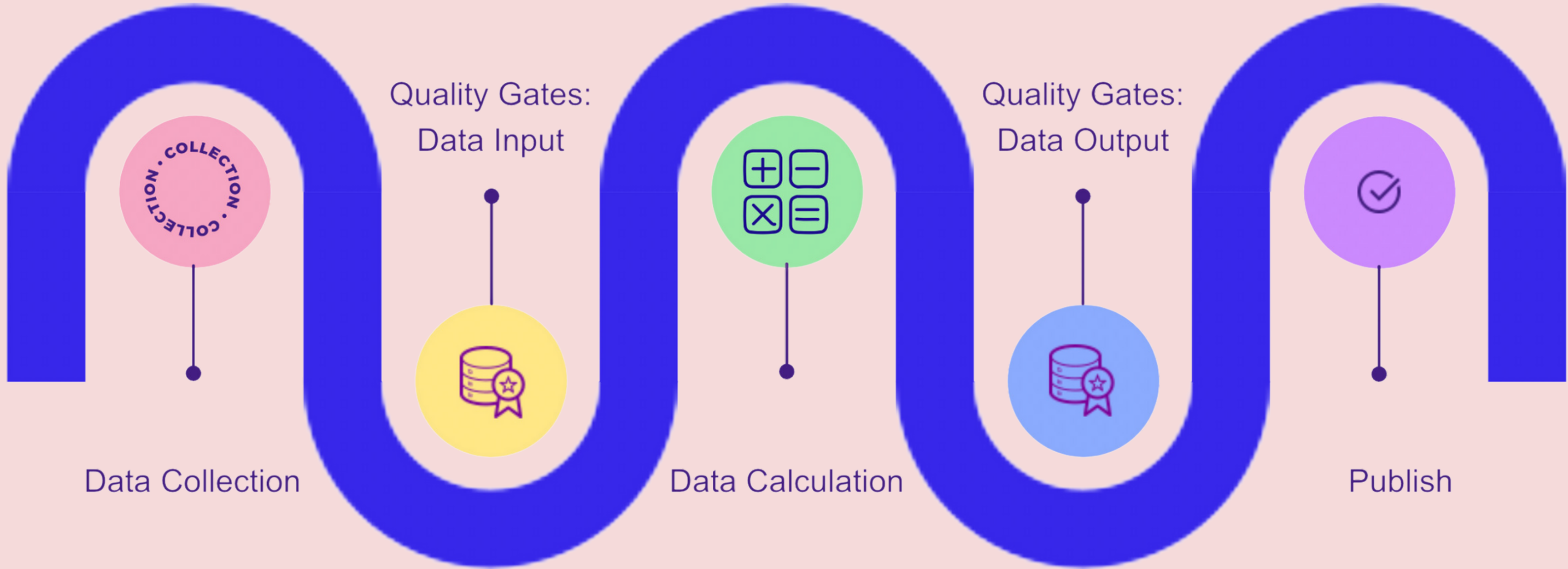
Pages

Blog

PAGE TREE

- 1. Introduction
- > 2. Background and context
- 3. Application and uses of MPD in tourism statistics
- > 4. Basic considerations when using MPD for tourism statistics
- > 5. Data sources, types and challenges
- > 6. Key tourism and travel concepts and considerations
- > 7. Methodology
- > 8. Quality Assurance
- > 9. Data checking, calibration and combining with other data sources
- > 10. Best practices / case study
- References

ROUTINES





DATA

TIME

LOCATION

EVENT
TYPE

CHARGING DATA

Billing domain log which stores successful charging transaction record such calls, messaging, etc.

LOCATION BASED ADVERTISING

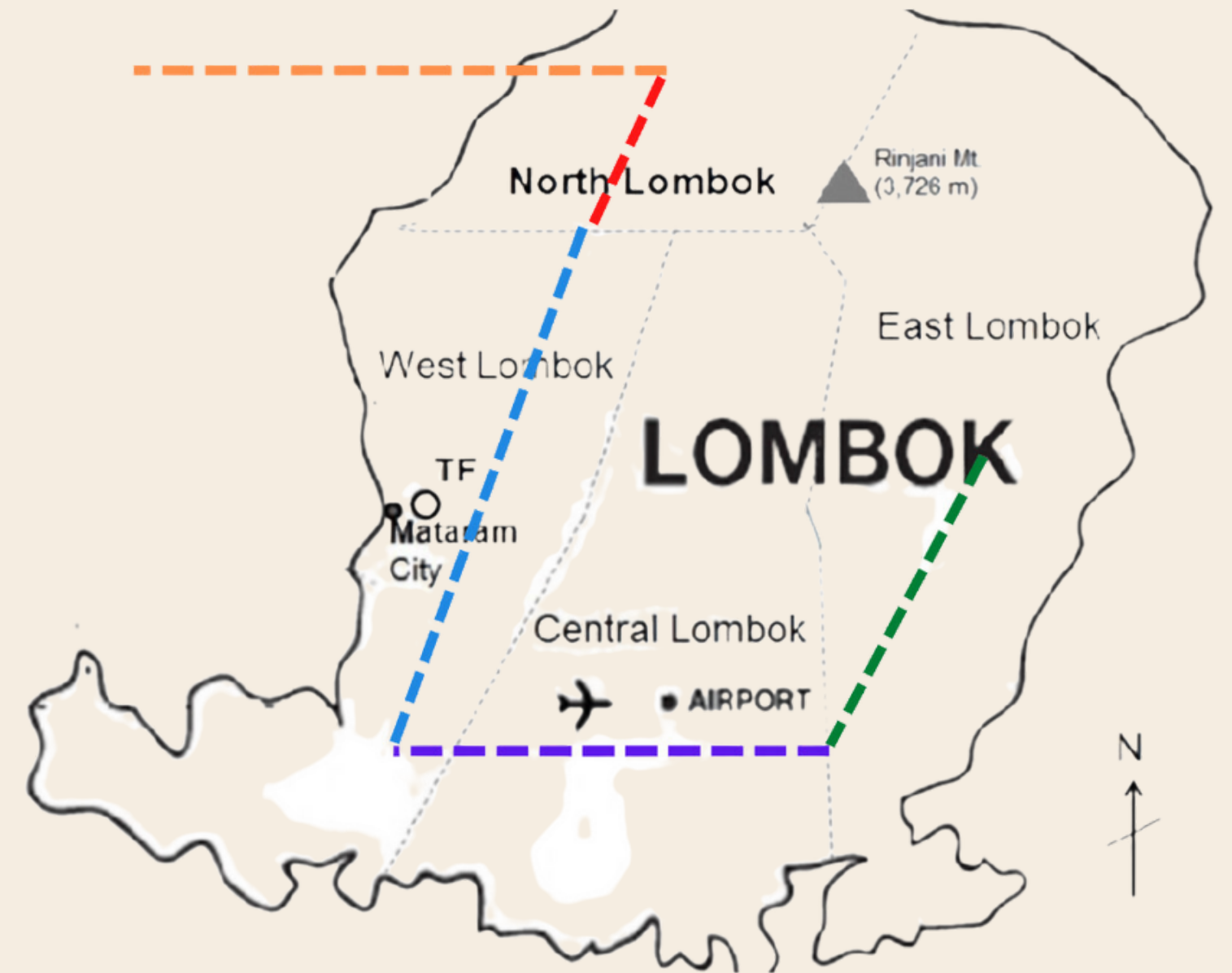
The technology is used to pinpoint consumers location and provide location-specific advertisements on their mobile devices.

INTERNET DATA USAGE

It provides policy, service, subscription, quota, and bearer resource management functions, as well as admission control for internet data usage.

Cell phone transactions generate logs, and this collection of logs is data.

time	longitude	latitude	province	city	district	signal
2021-05-22 19:27:57	106.909	-6.252	DKI Jakarta	Kota Jakarta Timur	Makasar	3G
2021-06-01 4:02:22	106.6628333	-6.120416667	Banten	Kota Tangerang	Benda	3G
2021-06-01 6:04:06	106.6628333	-6.120416667	Banten	Kota Tangerang	Benda	3G
2021-06-01 7:20:33	116.0411778	-8.463713889	Nusa Tenggara Barat	Kab. Lombok Utara	Pemenang	3G
2021-06-01 7:20:48	116.0411778	-8.463713889	Nusa Tenggara Barat	Kab. Lombok Utara	Pemenang	3G
2021-06-01 7:25:17	116.1602222	-8.669177778	Nusa Tenggara Barat	Kab. Lombok Barat	Kuripan	3G
2021-06-01 7:28:32	116.1602222	-8.669177778	Nusa Tenggara Barat	Kab. Lombok Barat	Kuripan	3G
2021-06-01 7:28:54	116.30575	-8.747777778	Nusa Tenggara Barat	Kab. Lombok Tengah	Praya Tengah	3G
2021-06-01 7:33:58	116.30575	-8.747777778	Nusa Tenggara Barat	Kab. Lombok Tengah	Praya Tengah	3G
2021-06-01 7:34:21	116.2739167	-8.761777778	Nusa Tenggara Barat	Kab. Lombok Tengah	Pujut	3G
2021-06-01 12:31:17	116.2739167	-8.761777778	Nusa Tenggara Barat	Kab. Lombok Tengah	Pujut	3G
2021-06-01 13:06:02	116.5207583	-8.646419444	Nusa Tenggara Barat	Kab. Lombok Timur	Selong	4G
2021-06-03 15:10:36	116.5207583	-8.646419444	Nusa Tenggara Barat	Kab. Lombok Timur	Selong	4G
2021-06-03 18:29:17	106.9013333	-6.24925	DKI Jakarta	Kota Jakarta Timur	Makasar	3G



A trip is defined as a journey from one usual environment to another,
On each trip, there can be visits to several places, but it is necessary to determine the main destination of the trip.
Please note that there are anomalies in the data, such as fast movers, that could affect your analysis.
For that, data cleansing needs to be done.

HOW MPD LOOKS LIKE

OTHER DATA SOURCES FOR STATISTICS PRODUCTION

- Official list of Mobile Country Code (MCC) and Mobile Network Code (MNC);
 - Official and recognized list of World countries (every country is recommended to use ISO 3166-standard codes)
 - Administrative geographical division (including shape file);
 - World time-zone polygons; and
 - Other reference data sources are available.
-

QUALITY CHECK



INPUT

- Data gaps
- Missing data
- Incorrect time stamps
- Duplicate record



THROUGHPUT

- Errors in data processing
- Overwrites

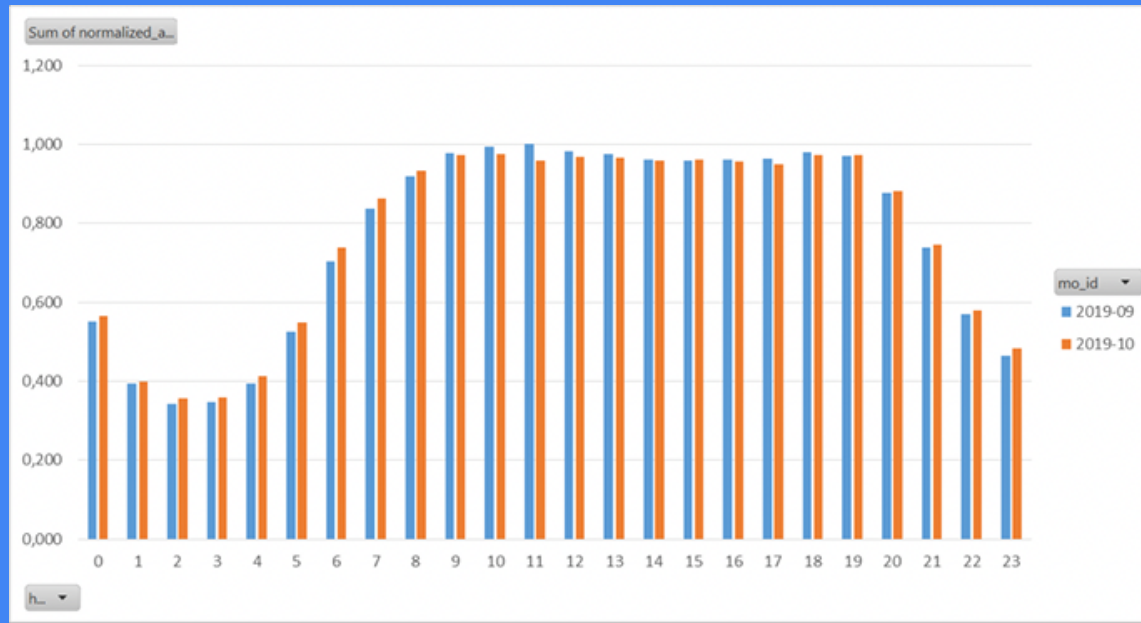


OUTPUT

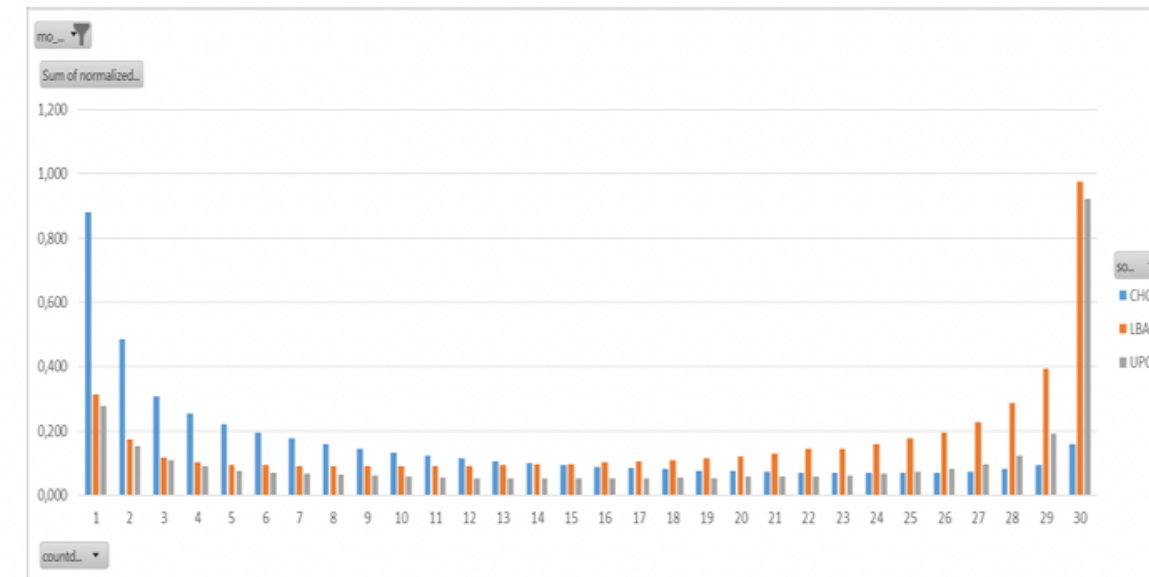
- Anomalies checking Coherence with other data
- New phenomena can be explained
- Passed Calibration/ Comparison with other data



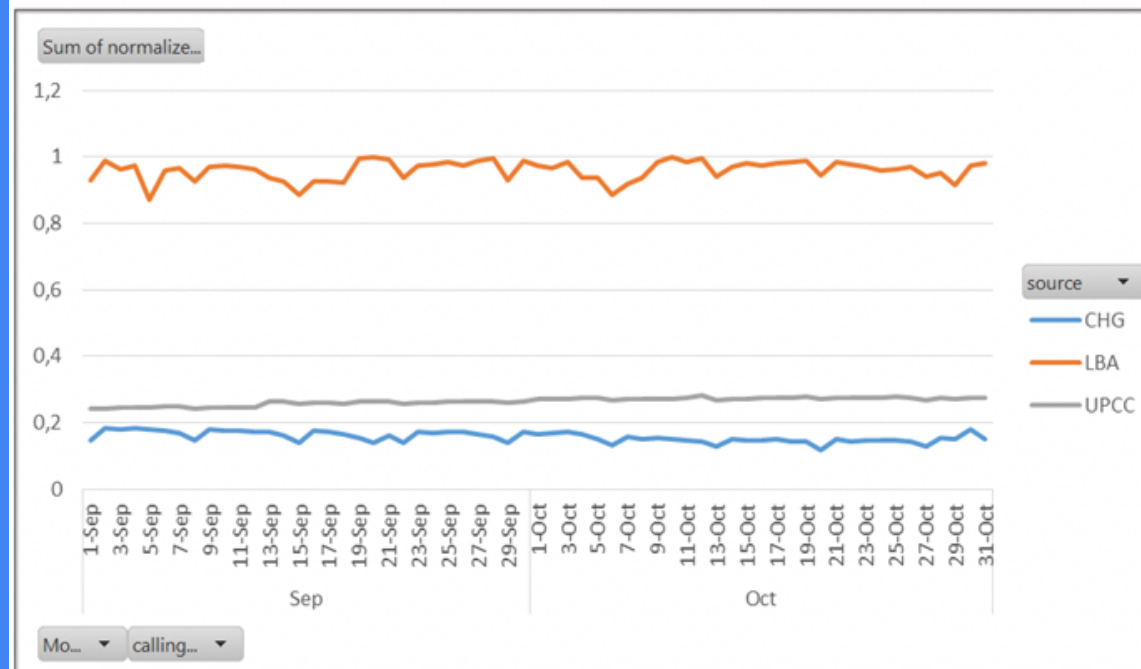
IS THE DATA GOOD ENOUGH?



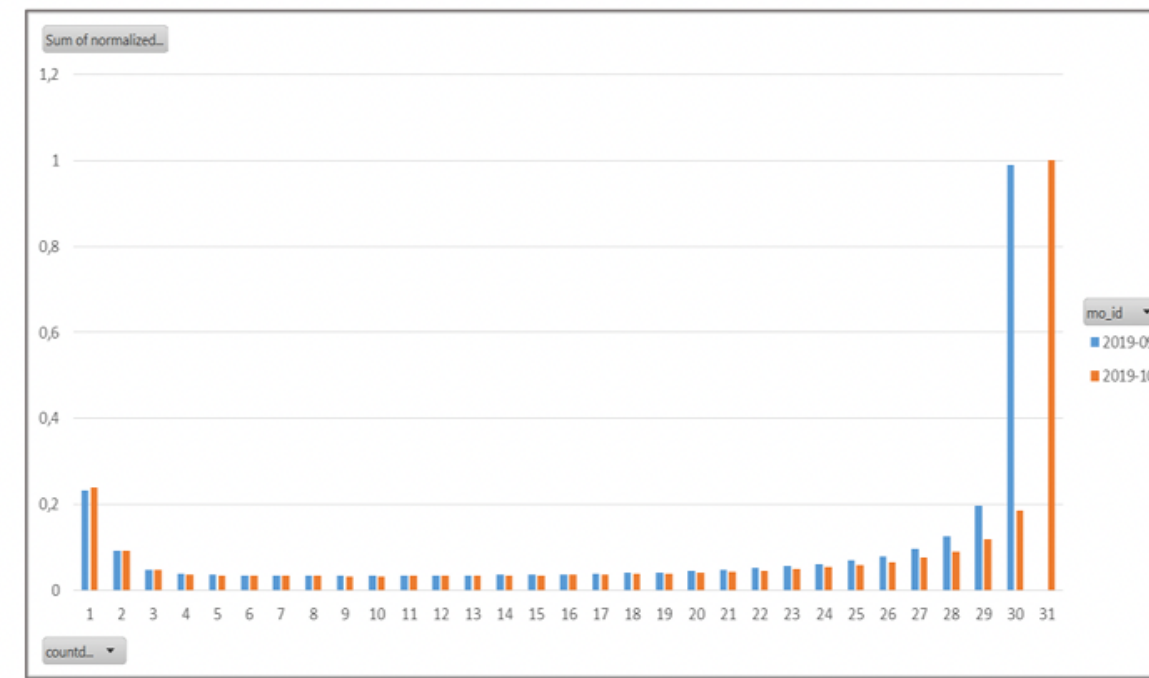
Natural hourly rhythm



Logical daily present



Steady data flow



Logical daily present

more details about QAF on MPD in Indonesia:
<https://proceedings.stis.ac.id/icdsos/article/view/134>



MAPPING

THE JOURNEY

1

Usual Environment

To every subscriber, apply the algorithm to determine the usual environments. These usual environments will be candidates for home, work, commuter & circular.

2

Trajectory

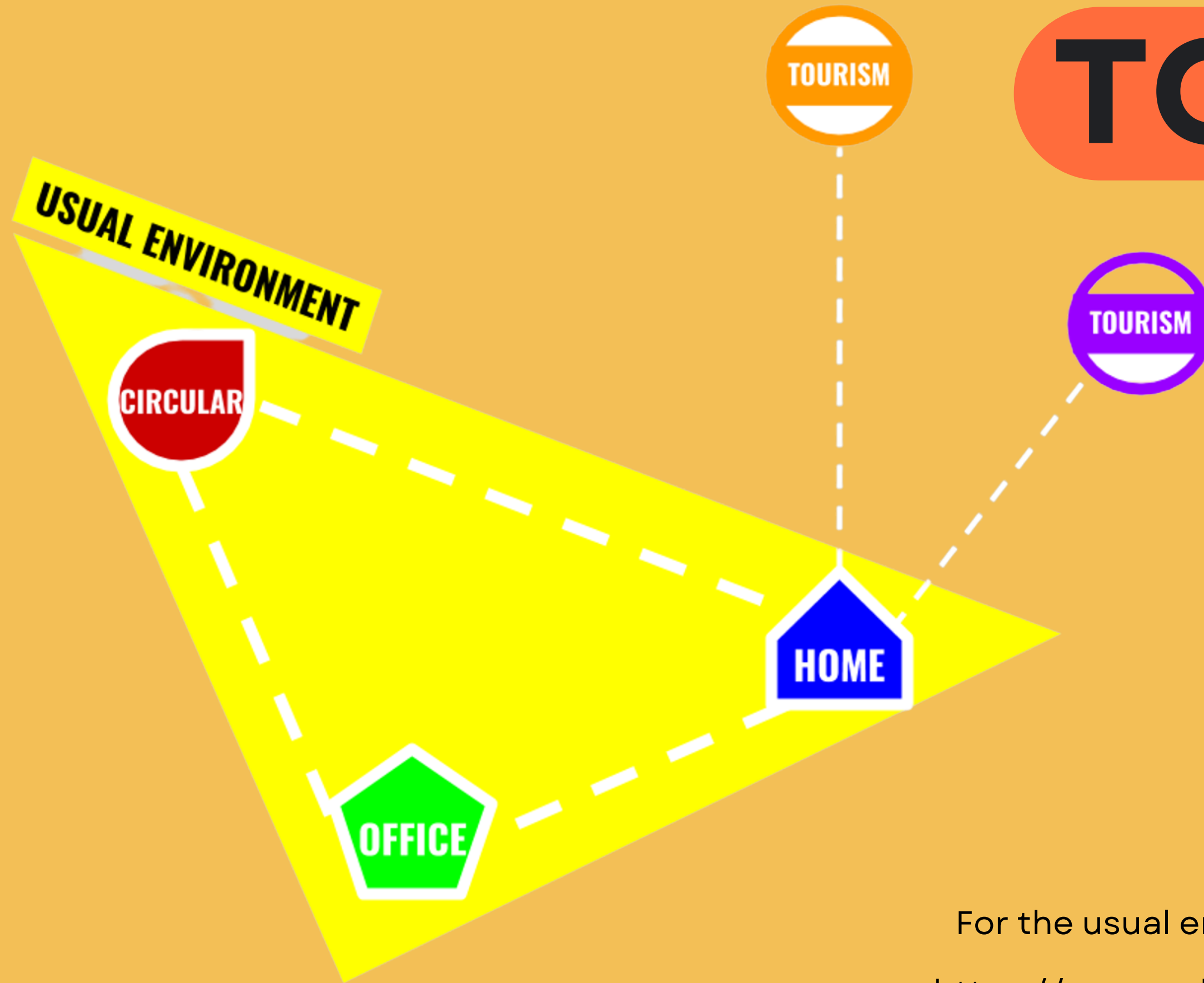
Create trajectory, a series of journeys starting from a usual environment to another/back to the original usual environment.

3

Labeling

Specify each destination for the usual environment, tourism, commuter, circular

TOURISM



"Tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes."

For the usual environment (AMDA) algorithm used by BPS, see:
<https://proceedings.stis.ac.id/icdsos/article/view/239>

CHALLENGES



Data Access

Intensive discussions are needed with mobile network operators regarding data usage, especially related to the issue of personal data protection. However, if it is successful with one operator, it opens the way for collaboration with other operators.



Standard Data

Different Mobile Operators have different data formats, it is necessary to convince them to use the same data standards to enable data integration.

Data Characteristics

It is necessary to study how data is formed to overcome data problems such as fast movers, accidental roaming, etc.

MPD IN INDONESIA

THE JOURNEY



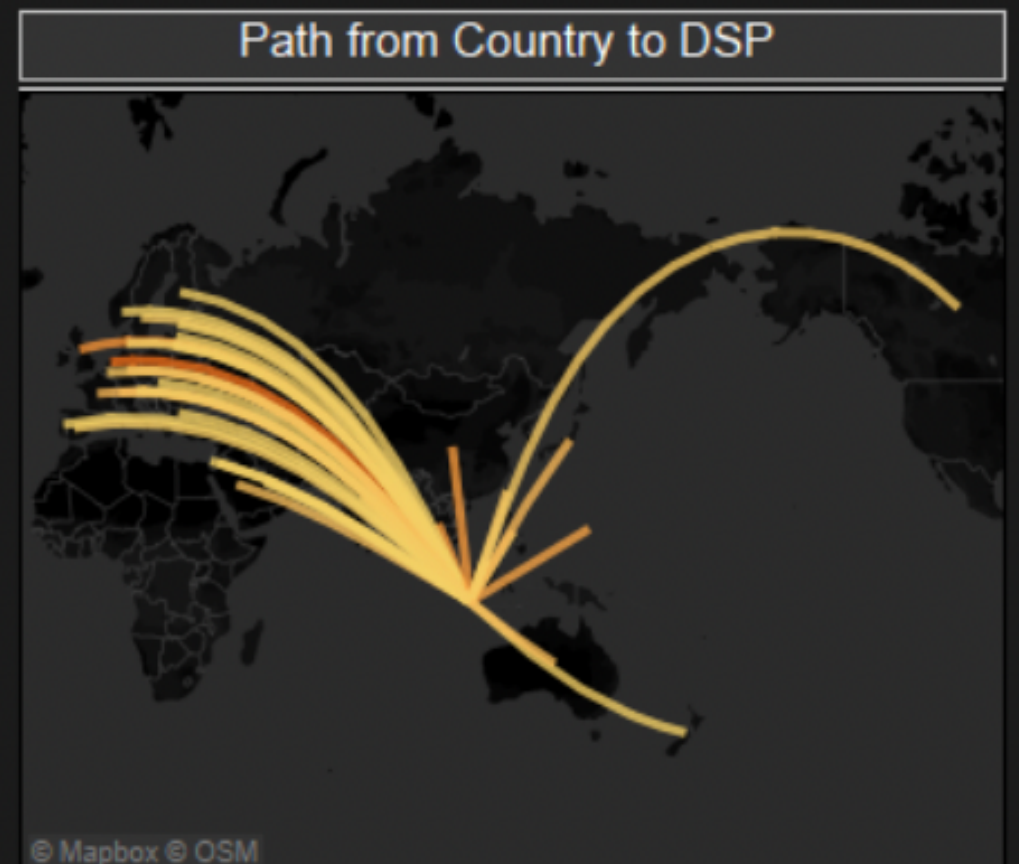
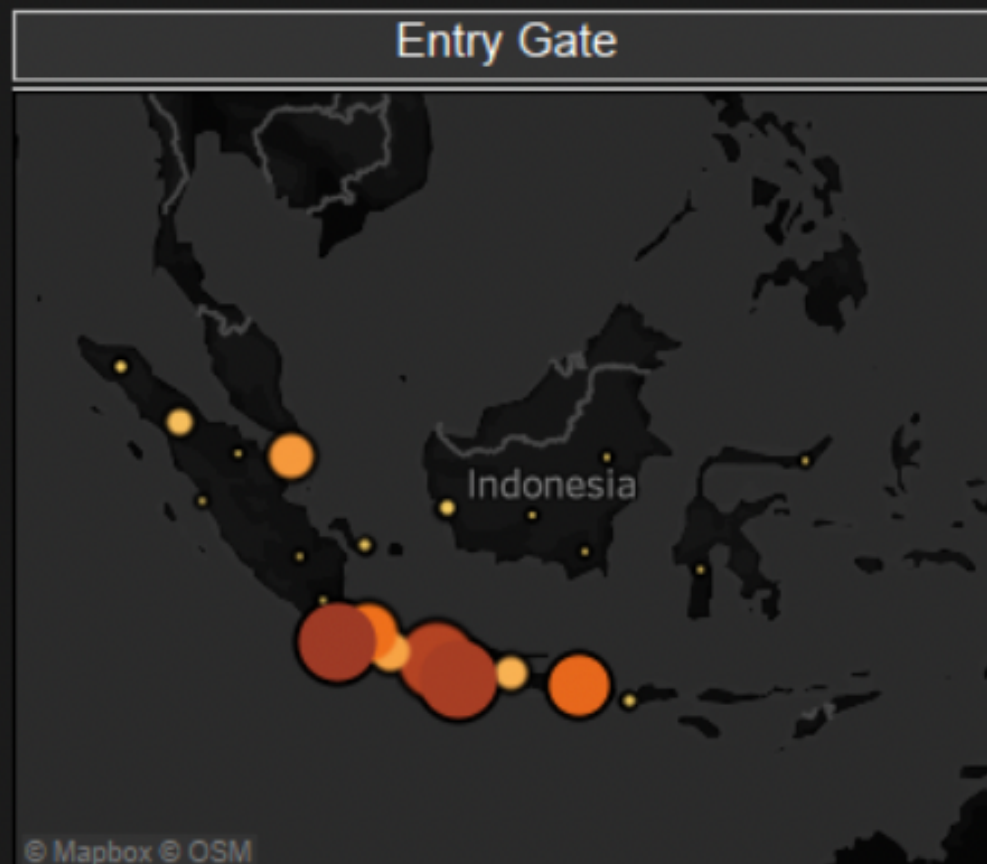
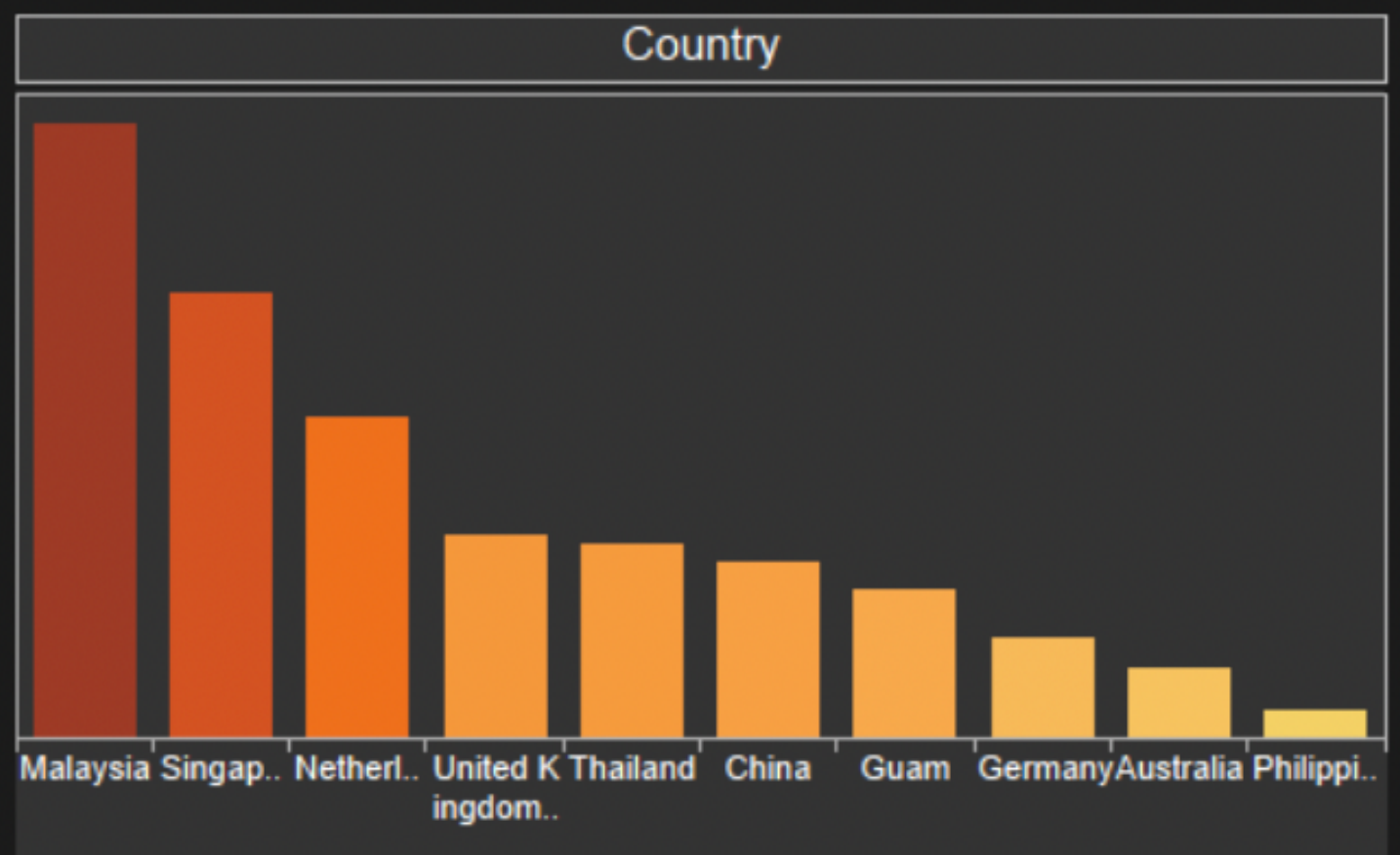
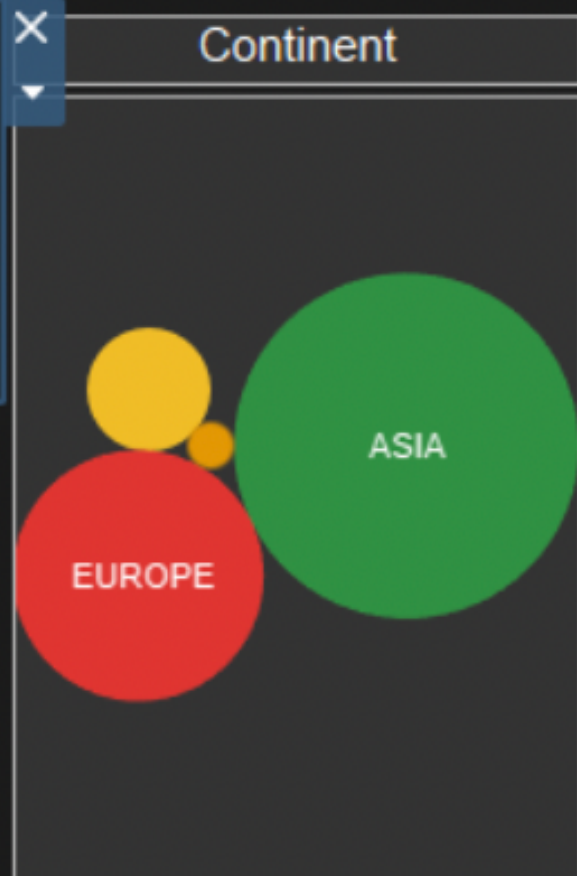
Inbound Tourism to Super-Priority Destination Indonesia with Mobile Positioning Data

February 2020

Borobudur

October 2019 November 2019 December 2019 January 2020 February 2020 March 2020

	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020
Malaysia	21	10	392	294	236	126
Singapore	23	18	342	310	171	146
Netherlands	35	3	202	184	124	59
Guam	9	4	136	109	57	20
United Kingdom	5	8	127	127	78	56
China	25	3	115	261	68	12
Thailand	4		88	77	75	12
Australia	1		79	80	27	14
Philippines			61	23	10	9
Germany	10	3	58	49	39	26
Japan	2	7	57	73	33	13
India	4		44	23	24	6
Denmark	2		41	2	5	5
Spain	11		32	39	9	14
Saudi Arabia	5	1	27	24	24	20
France		1	25	35	32	20
Switzerland	2		19	20	15	4
Sweden	4		13	13	11	9
Belgium	4	3	13	7	16	12
New Zealand	1		10	11	2	
Austria	2		10	12	6	5



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MPD Combine with Digital Survey

		MPD + Digital Survey	Traditional Survey
MPD	{	Origin	Origin
		Destination	Destination
		Length of Stay	Length of Stay
		Length of Journey	Length of Journey
Digital Survey	{	Purpose of Trip	Purpose of Trip
		Demographic	Demographic
		Expenditure	Expenditure
		Modes of transportation	Modes of transportation

MPD vs Conventional Survey

No	<i>MPD Approach</i>	<i>Household Approach (Conventional)</i>
1	Estimates for smaller areas: districts/cities	Estimates up to the provincial level
2	Monthly data period	Yearly data period
3	No surveyors needed	The number of surveyors needed depends on the number of samples
4	With a more detailed level of estimation, the required budget is only around IDR 15 billion	To conduct a conventional domestic tourist survey, a budget of around IDR 30-40 billion is needed (based on the 2018 and 2019 conventional domestic tourists survey budget).
5	It has the potential to be able to generate statistics for domestic tourists monthly	Can only generate statistics for domestic tourists on annualy
6	The solution for collecting data for domestic tourists during the covid-19 pandemic, no door-to-door interviews needed	The Covid-19 pandemic condition limits conventional data collection activities
7	MPD can be used for other statistical calculations	One activity is only used for one type of statistical calculation

ANOTHER BEST PRACTICES

Georgia



Working with all three operators in Georgia to calculate inbound, outbound, and domestic tourism.

Estonia



The central bank uses MPD from Estonian mobile network operators to quantify inbound and outbound travel

Netherlands



using machine learning in modeling MPD to classify tourism and travel

Austria



The use of MPD to calibrate the extrapolation weights of the sample survey for holiday and business trips



CONCLUSION

- **MPD provides better coverage than household surveys**
- **MPD is more efficient both in terms of budget and human resources used**
- **MPD provides tourism data in a faster time**





 Thank You 

mpd@bps.go.id
