Introduction

Various policies are taken based on observations on human movement:

- residential zones,
- business zones,
- transportation facilities and routes,
- education,
- **tourism**,
- and many more.

Mobile Positioning Data has become one of the new data sources that are considered to have good sustainability to describe the human movement over time in a massive, accurate, and timely.
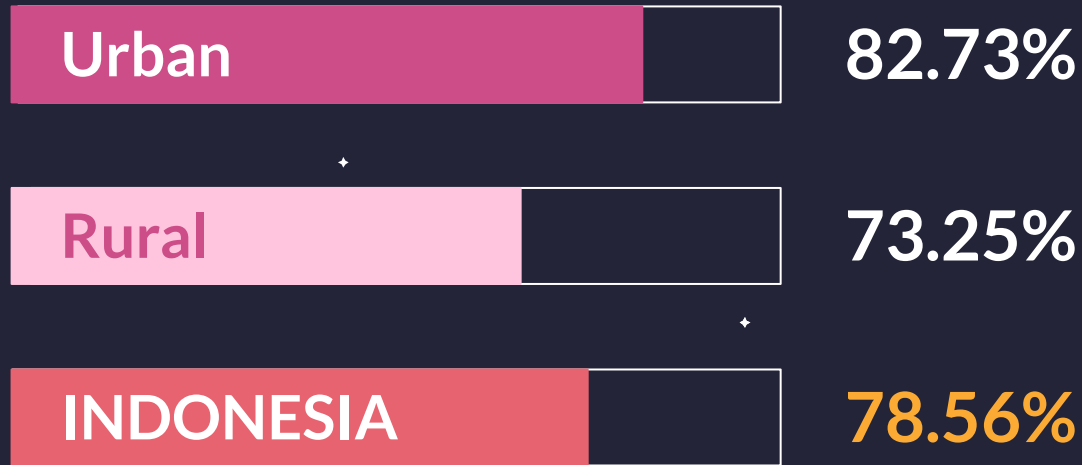
The Use of MPD in Indonesia

- Until 2019, the statistics of the national socio-economic survey show that the estimated household that owns cellular phones in Indonesia has reached **63.53%.**
- As a result, **log records** of the use of cellular telephones are available (which were initially only used for billing needs) massively. It records the patterns that can be used to describe the mobility of subscribers.
- Start in 2017, The use of MPD in Indonesia as official statistics was initiated by the Ministry of Tourism in collaboration with Statistics Indonesia to record **foreign tourist traffic at cross-border** posts where there was no immigration office.
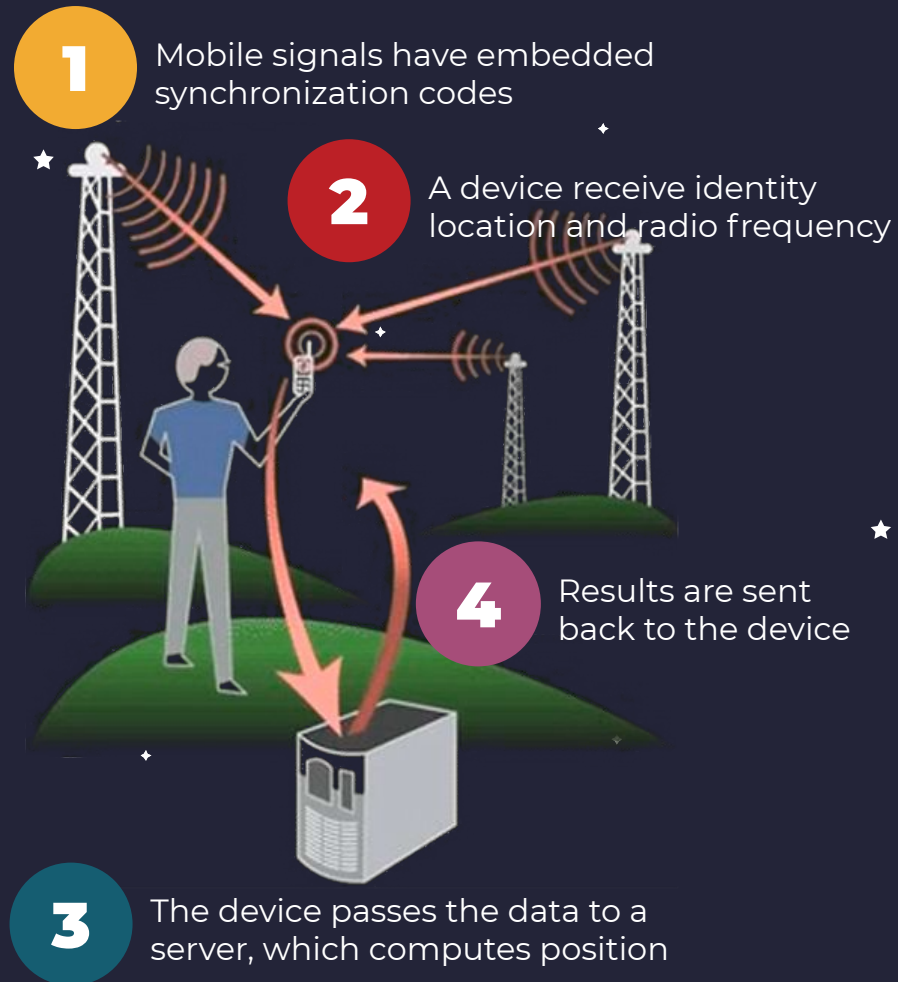
Percentage of Population Aged 5 years and over who use Cell Phone in Indonesia, 2020

Urban 82.73%

Rural 73.25%

INDONESIA 78.56%

How cellular technology works

Every transaction leaves a log, and these logs create datasets

1 Mobile signals have embedded synchronization codes

2 A device receive identity location and radio frequency

4 Results are sent back to the device

3 The device passes the data to a server, which computes position

Mobile Phone
Log Dataset Example

msisdn	datetime	source	lat	lon
bscjgug54a	20171202171409	LBA_ALL	-6.24839	106.9108
bscjgug54a	20171202211454	LBA_ALL	-6.24839	106.9108
bscjgug54a	20171203011443	CHG_POST	-6.24511	106.9055

msisdn
Hashed MSISDN

Source
Type of data stored (CDR, signalling)

Datetime
Transaction timestamp

Lat & Lon
BTS coordinates

Coordinate (Lon, Lat) matching to Local Administrative Units (LAU) Master

msisdn char	datetime timestamp	source char	bts_lat char	bts_lon char	prov char	kab char	kec char	desa char	trx_date date
6281 ...	2018-02-08 13:33:03	LBA_ALL	-4.54691	120.35833	SULAWESI SELATAN	BONE	TANETTE	CELLU	2018-02-08
6281 ...	2018-02-08 13:51:39	CHG_POST	-4.54051	120.30777	SULAWESI SELATAN	BONE	TANETTE	MACANANG	2018-02-08
6281 ...	2018-02-08 14:00:39	CHG_POST	-4.53591	120.30377	SULAWESI SELATAN	BONE	TANETTE	MACANANG	2018-02-08
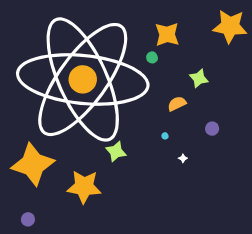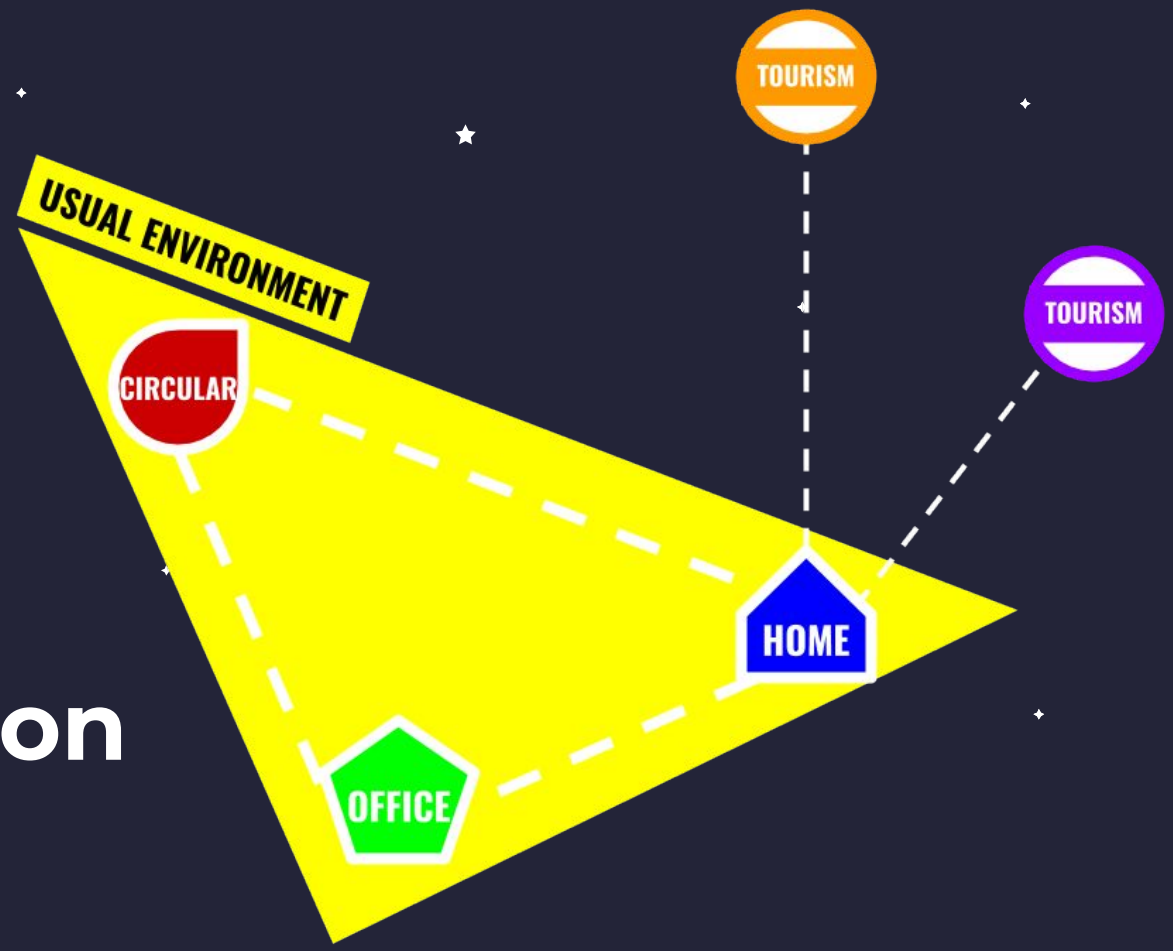
MPD versus Survey: The Data

Mobile Positioning Data	Survey
Origin	Origin
Destination	Destination
Length of Stay	Length of Stay
Length of Journey	Length of Journey
	Purpose of Trip
	Demographic
	Expenditure
	Modes of transportation

MPD Combine with Digital Survey

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

MPD — Origin, Destination, Length of Stay, Length of Journey

Digital Survey — Purpose of Trip, Demographic, Expenditure, Modes of transportation
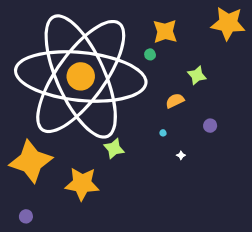
Combine Methods: MPD + Survey

3 Blast SMS to people at point 2, ask them to fill out digital surveys. Continue until the target sample is reached.

4 Send rewards for those who complete the survey.

1 These are the people who have the usual environment

2 Some of them travel outside the usual environment. Based on the algorithm, determine the destination.
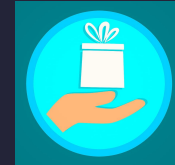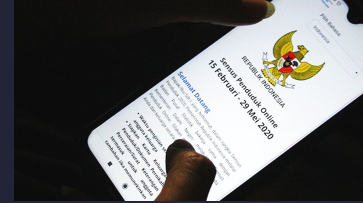
Comparison of Response Rates Based on the type of Gimmick in the Digital Survey 2018

No	Gimmick	SMS Blast	Response	Response Rate
(1)	(2)	(3)	(4)	(5)
1	Voice on Net 40'	121.120	302	0,25%
2	Data 50 MB	1.334.375	3.514	0,26%
3	TCash	7.755.842	46.184	0,60%
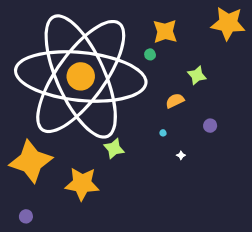
Comparison of Response rate and Gimmick Value of Digital Survey, 2018-2020

No	Year	Gimmick Value	Survey Periode	*Response rate*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
1	2018	4.500	Sep - Dec	0,60%
2	2019	4.500	Sep - Dec	0,47%
3	2020	5.000	Aug - Dec	1,20%

MPD vs Conventional Survey

No	MPD Approach	Household Approach (Conventional)
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

Thank You

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