



# Position Paper by the Task Force on the Use of Mobile Network Operator (MNO) data for official statistics

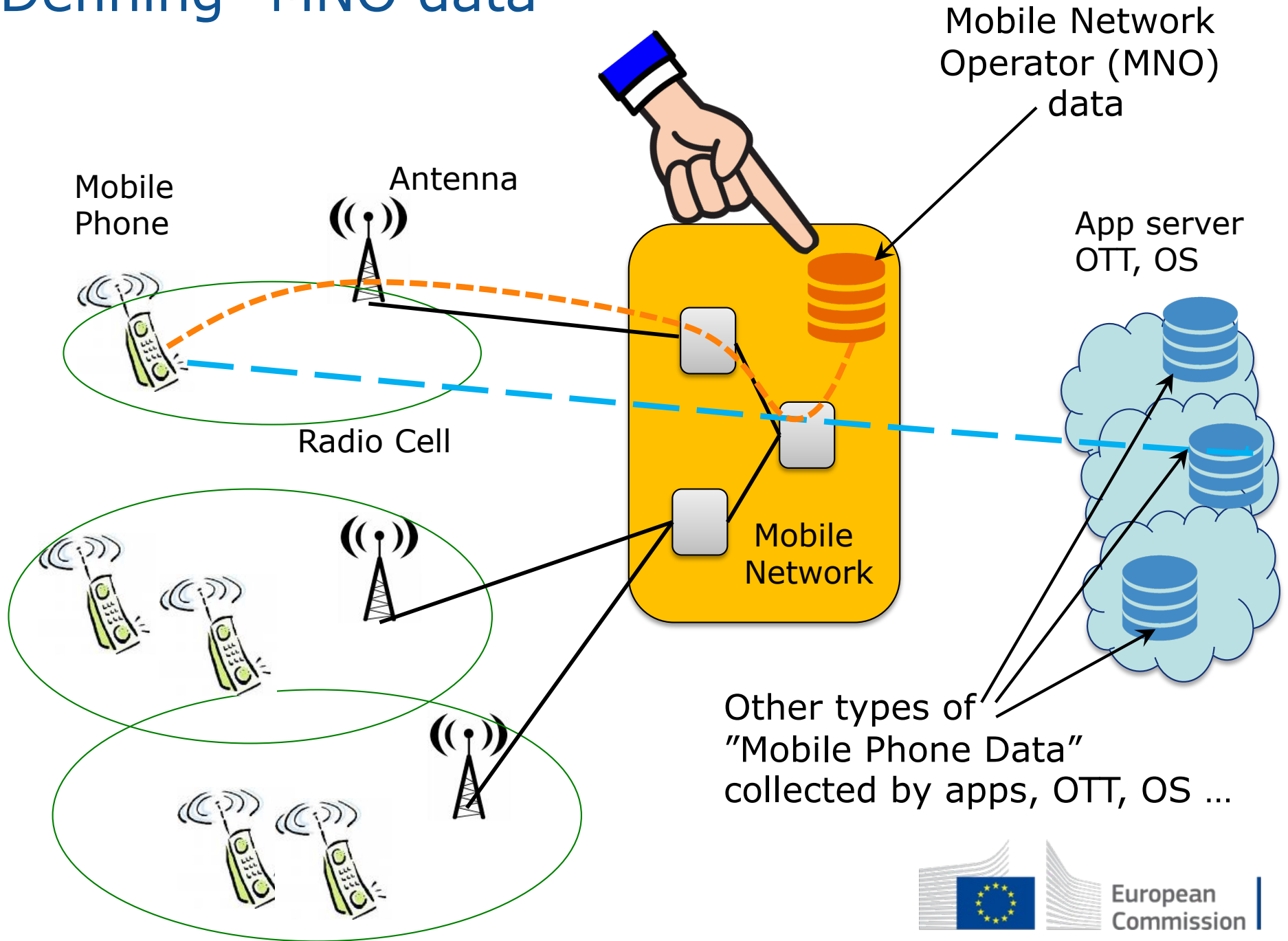
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Eurostat - Unit A5 'Methodology; Innovation in Official Statistics'

DIME-ITDG Steering Group meeting

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# Defining "MNO data"



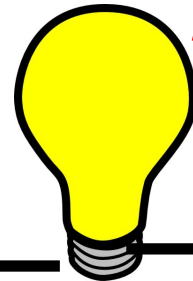
# Shines and shadows of MNO data for statistics

- *'MNO data' carry spatiotemporal information about phones*
  - Records in the form **<phone ID, timestamp, cell ID>**
  - Can be used to measure human **presence** (where people are) and **mobility** (where and when they move to/from)
  - ... taking "phones" as proxies for "humans"
- *Appealing aspects of aggregate statistics based on MNO data*
  - Timeliness, temporal granularity, temporal continuity
  - Spatial coverage - whole country, whole EU
  - Population coverage - almost everybody carries some phone(s)
- *Limitations and challenges of individual data points*
  - Population coverage uncertainty (phones : people  $\neq$  1:1)
  - Spatial uncertainty (varying, possibly low spatial resolution)
  - Temporal uncertainty (discontinuous observations)
  - Lack of "purpose" information and sociodemographic variables
  - Data access issues (business, legal)

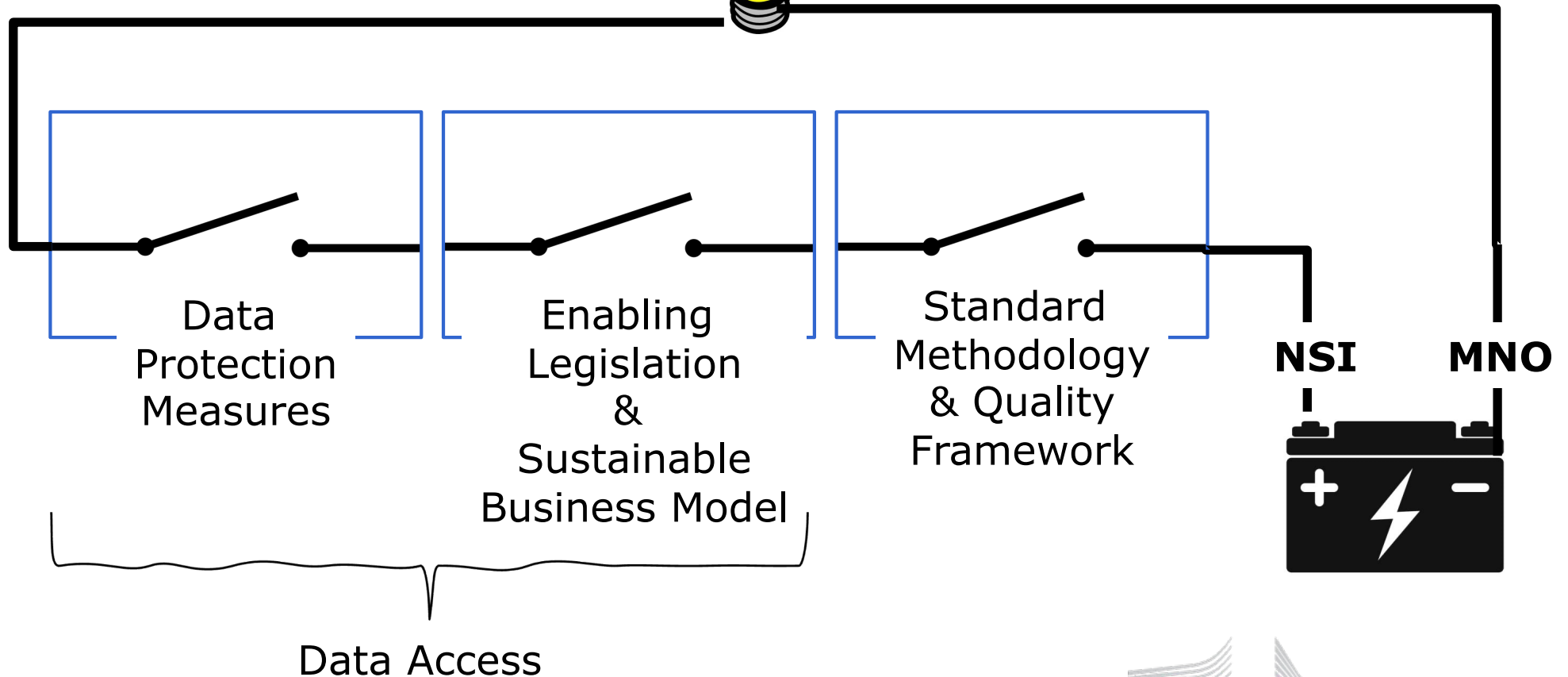
# Experimental vs. Official Statistics

- *“Research” & “Experimental stat.” vs. “**Official statistics**”*
  - One-off case study or short series vs. regular production
  - Partial vs. complete fulfillment of quality criteria
- *Past work in the ESS about MNO data*
  - Activities at **national level** in several countries, mostly limited to “research” or “experimental statistics”, very **heterogeneous** in every aspect
    - Reflecting fragmentation of national legislations and differences in voluntaru agreements between NSIs and MNOs
    - Mostly based on proprietary methods developed by MNOs
  - Boost of NSI-MNO collaborations during Covid crisis
  - At European level, the ESSnet Big Data II (2018-2020) started to lay initial foundational work towards a common EU approach

# Series of Challenges

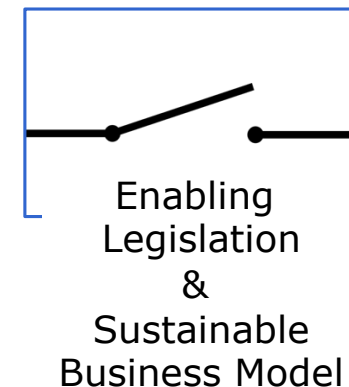


**Regular** production of **Official** Statistics based on MNO data



# Data Access – recent actions

- *Expert Group on facilitating the use of new data sources for official statistics (B2G4S)*
  - Final report with recommendations, June 2022  
<https://ec.europa.eu/eurostat/en/web/products-statistical-reports/-/ks-ft-22-004>
  - Overview of the critical aspects of Privately Held Data, applicable also to MNO data
- *Legislation: EC proposal for amending Regulation N. 223/2009 on European stats*
  - Relevant for all Privately Held Data
  - Target adoption by 2024 (?)
  - NB: Secondary legislation may be still needed afterwards to define operational aspects



# ESS Task Force on MNO data (TF MNO)



- *TF MNO established in Jan. 2021*
  - 2 year mandate, renewed in Jan. 2023
  - Sub-group of WG Methodology
- *Participation by 19 countries*
- *3x plenary meetings (remote) per year*
- *Focus on **methodological aspects** (no data access)*
  - ...support sharing of experience from national pilot projects involving the use of MNO data for experimental statistics
  - ... networking of the relevant experts across ESS members
  - ...identify key methodological directions that should be prioritized for further development
  - ... proposing activities at to further develop methods and tools for the (re)use of MNO data in the ESS.

# Outcome until now



- *Convergence of views (!)*



- *Position Paper formulating a common view*



- *Steering content of 2x ESS projects  
launched in 2023 (1.2 Mio + 900 keur)*

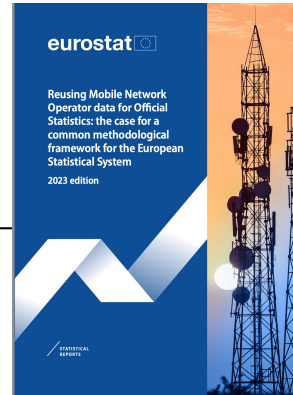


# Position paper by TF MNO

- *Title: Reusing Mobile Network Operator data for Official Statistics: the case for a common methodological framework for the European Statistical System*
  - Authored by TF MNO during Q4/2022 – Q2/2023
  - Drafting process triggered discussion and clarification of several important aspects
- *Published by Eurostat in "Statistical Reports" series*
  - <https://ec.europa.eu/eurostat/en/web/products-statistical-reports/w/ks-ft-23-001>



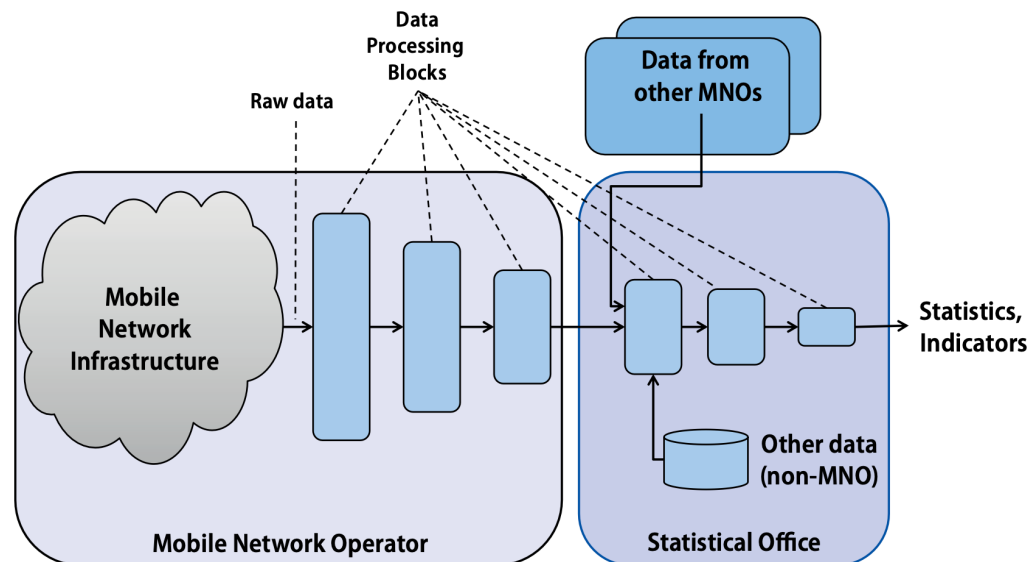
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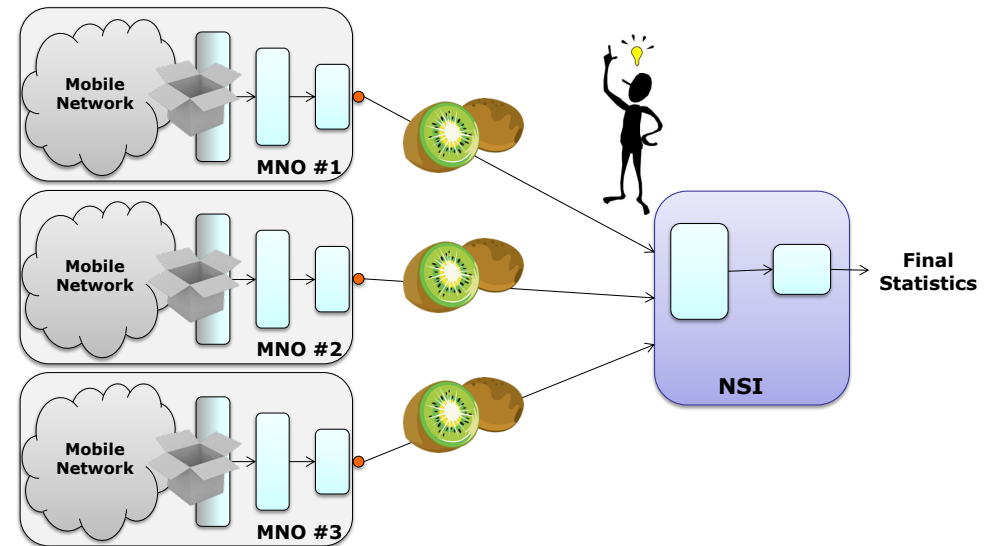
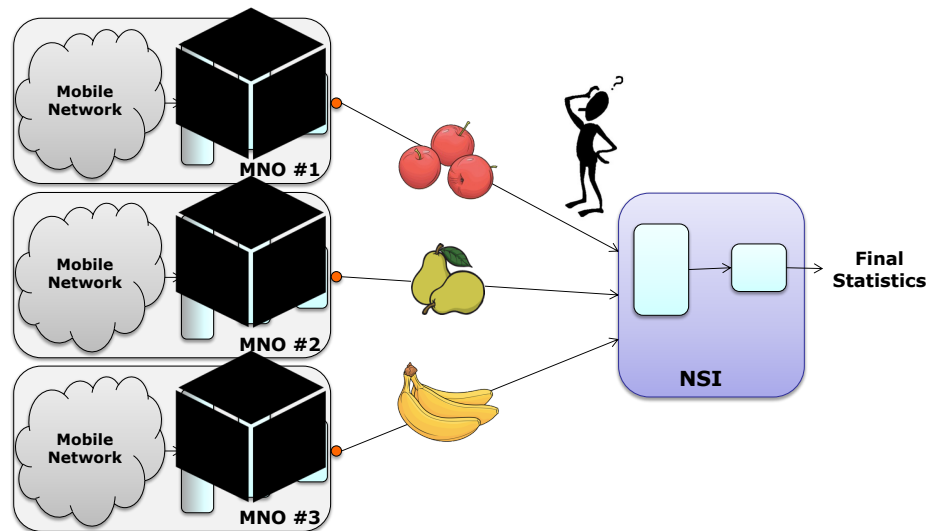
# The case for methodological standardisation

- *Methodologies for transforming raw MNO data into official statistics to be as standardised as possible across EU*
  - One open ESS methodology applied to all MNOs instead of many proprietary/closed methodologies
- *Standardisation to cover whole **end-to-end data flow***
  - Oblivious to where processing takes place, MNO premises vs NSI
  - Standard cannot be too rigid: some degree of flexibility is needed to adapt to different MNO settings (raw data are NOT standardised!)



# The case for methodological standardisation

- *Common/standard methodologies and definitions necessary to achieve **comparable** and **combinable** results*



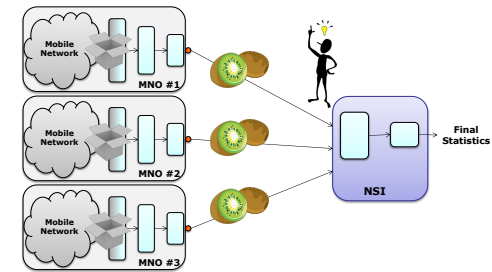
# The case for methodological standardisation

- *A **common and open ESS methodological standard** defined at EU level ...*
- *... allows to define a **common ESS quality framework** tailored for MNO data*
- *... provides a reference basis to clarify appropriate **protection measures for personal data** directly at EU level and in consultation with EDPS/EDPB*
  - Overcoming fragmentation of national legislations and heterogeneity of GDPR application at national level

# Meta-requirements for a ESS methodological standard

- ***Transparency and reproducibility*** – *open methodologies and open-source reference software implementation*
  - Does not exclude the use in production of commercial proprietary software implementations that are full compliant (functionally aligned) to the open-source reference
  - Test data and functional testing procedure accompanying open-source reference implementation to support compliance checks
- ***Modularity*** – *to handle complexity and for maintainability*
- ***Evolvability*** – *MNO networks evolve, MNO data change, demand changes and new use-cases emerge...*
- ***Quality*** aspects to be developed jointly with methodology
  - New challenges for input quality and throughput quality

# Multi-MNO orientation



*“The envisioned ESS methodological standard should be designed upfront to produce statistics based on the combination of information **sourced from multiple MNOs** (multi-MNO statistics) within and across different European countries. “*

## *Advantages of Multi-MNO approach **within each country***

- Better representativeness of the total population, lower exposure of the final statistics to population coverage bias*
- Improved temporal stability, mitigation of churning in mobile subscriptions*
- Improved robustness to anomalies and disruptions of data provision, lower sensitivity to MNO-specific network conditions*
- Equal treatment of all MNOs (“level playing field”)*
- Easier protection of business-sensitive of individual MNOs information in the final statistics*

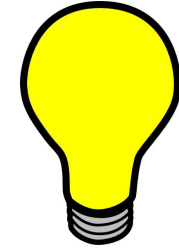
# Fusion of MNO data and non-MNO data

*“Experience with past experimental and research projects has shown the necessity to **combine MNO data with other kinds of non-MNO data to stabilise, correct or calibrate the final statistics.**”*

- *Methodological and quality need: non-MNO data can help to assess/correct/mitigate issues related to population coverage uncertainty (under- and over-representation), churning of mobile users, lack of socio-demographic variables, etc.*
- *Open research aspects: Which non-MNO data are best fit to be combined with MNO data? And how to combine them with MNO data?*
  - New ad-hoc sample survey designed *on purpose* by NSI?
  - Legacy survey data?
  - Census data?
  - Other “big data” sources held by external entities (e.g., train tickets)
- *Strategic implications for MNO-NSI partnerships*



# The vision



- *In 202x MNO data are (re)used for regular production of **official statistics***
  - Not merely “experimental statistics”...
  - Data from multiple MNOs in each country and across countries - **Multi-MNO**
  - Processed according to **standard methodologies** and transparent **quality criteria** defined at EU level (by the ESS in collaboration with industry)
  - **Evolvable** methodological framework
  - Processed (at least partly) at MNOs premises
  - Built-in privacy protection measures defined at EU level
  - Combined with non-MNO data for calibration/stabilisation/validation

# Steps towards there ... (1/2)



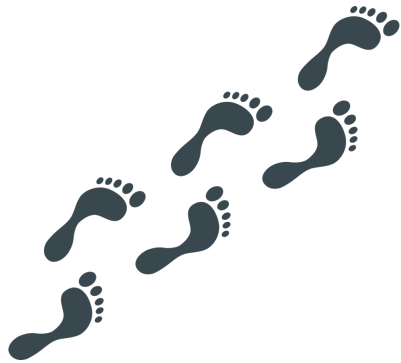
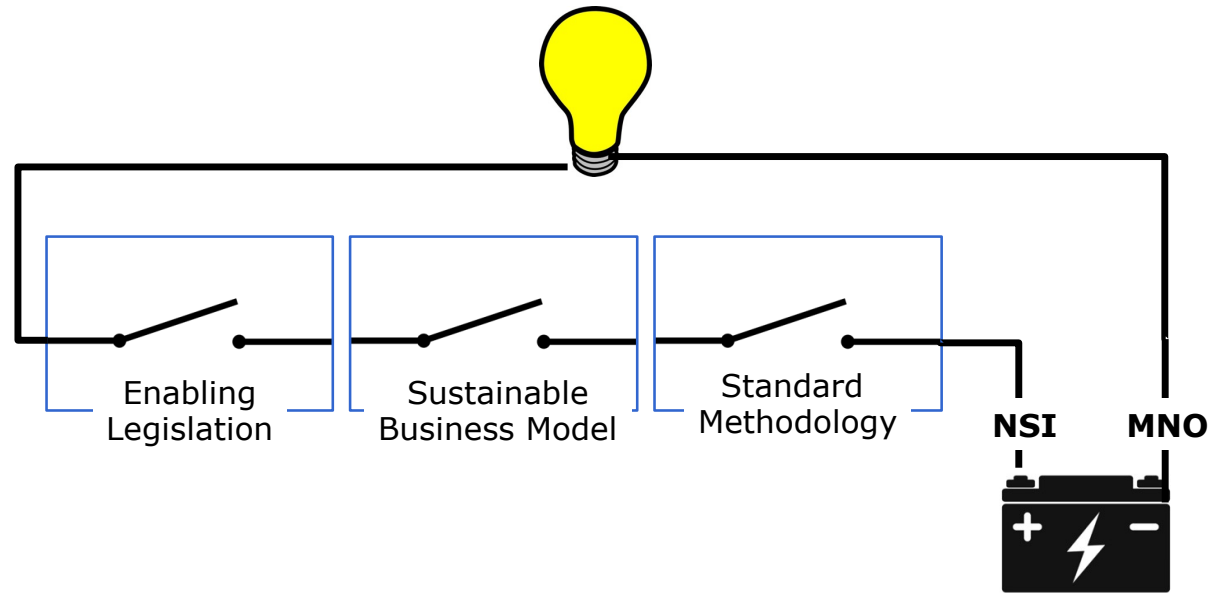
- *MultiMNO project: **co-development partnership** involving NSI experts and industry experts working together*
  - Started in Jan'23 for 2.5 years, until mid 2025
  - Public procurement procedure based on open call for tenders, 1.2 Mio
- *Project Objectives*
  - *Develop a first proposal for an open end-to-end **methodological framework** and associated **quality criteria**, with focus on an initial selection of use-cases*
  - *Open-source **reference software pipeline** implementing the proposed methodological framework;*
  - *Practical **demonstration** of the processing pipeline on real-world data across 5x MNOs in 4x EU countries*
- *Consortium*
  - *GOPA (Germany, consortium leader)*
  - *2x Industry partners: NOMMON (Spain), POSITIUM (Estonia)*
  - *2x NSI: CBS (Netherlands), ISTAT (Italy)*
  - *5X MNOs: Orange Spain, Vodafone Spain, Vodafone Italy, A1 Slovenia, POST Lux.*

# Steps towards there ... (2/2)



- *ESSnet METH-TOO: **research grant** focusing on the combination of MNO and non-MNO data*
  - Started officially on 1st November 2023 for 2 years, 900 keur
  - Consortium of 10x NSI, ISTAT coordinator
- *Project Objectives*
  - *WP1 - Landscaping analysis of candidate non-MNO data sources* lead FR
  - *WP2 - Developing formal methods and open-source tools for integration of MNO and non-MNO data* lead NO
  - *WP3- Proof of concept of ad-hoc survey to improve MNO data* lead AT

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SCB	STATISTISKA CENTRALBYRAN	SE
INE-PT	INSTITUTO NACIONAL DE ESTATISTICA PORTUGAL	PT



*Let's keep walking ...*

*Thanks for your attention*

# References

- *Overview of recent Eurostat work in the field (since 2018) MNOdata4OS page<sup>(\*)</sup>*

[https://cros-legacy.ec.europa.eu/content/mobile-network-operator-data-official-statistics-mnodata4os\\_en](https://cros-legacy.ec.europa.eu/content/mobile-network-operator-data-official-statistics-mnodata4os_en)

- *TF MNO Position Paper*

<https://ec.europa.eu/eurostat/en/web/products-statistical-reports/w/ks-ft-23-001>

- *MultiMNO project<sup>(\*)</sup>*

[https://cros-legacy.ec.europa.eu/content/multi-mno-project\\_en](https://cros-legacy.ec.europa.eu/content/multi-mno-project_en)

(\*) Temporary page due to ongoing migration of Web platform for Eurostat research and collaboration activities