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UNDERGROUND UTILITY MAPPING IN MALAYSIA – MOVING BEYOND 2020

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PRESENTATION OUTLINE

- Introduction
- Role of JUPEM in Underground Utility Mapping
- Issues and latest approaches in Underground Utility Mapping
- Concluding Remarks



INTRODUCTION



Requirement Of Underground Utility Mapping

- Issues pertaining to damages to underground utility installation.
- Damages and accidents happened during earth excavation for road widening and shifting of underground utilities.
- Such damage is due to unavailable or inaccurately determined location and depth of underground utilities



Damages Done During Excavation For Installation Of Underground Utility



There is little coordination between utility providers resulting in damages to underground utilities during excavations

Main Reasons For Damages



Available data in the form of design Layout



Data not up-to-date (existence of gaps)



Surveying not done during installation



Survey or detection works not properly done (by unqualified parties)
or
Design of new installation based on Inaccurate survey and detection work

Consequences Of Damage Underground Utility Installations

- Increase in cost of project
- Delays to project implementation
- Disruption to consumers and industries
- Loss of income to businesses



ROLE OF JUPEM IN UNDERGROUND UTILITY MAPPING



Underground Utility Mapping In Malaysia

- Mapping of own utility is the responsibility of every utility provider.
- Utility providers are the major contributor of underground utility for the whole country:
 - Tenaga Nasional – Electricity
 - Telekom – Telecommunication
 - Water Authorities - Water
 - IWK – Sewerage
 - Gas Malaysia - Gas
- Controlled and governed by legislation but not legislatively mandated to deposit their data to any repository body.
- Mapping is usually done by utility contractors or Licensed Land Surveyors.

JUPEM As Competent Authority In Underground Utility Mapping

- JUPEM is a government agency responsible for cadastral and mapping activities in Malaysia.
- A competent authority - entrusted by the government to manage underground utility information due to frequent disruption of services caused by damage to underground utilities. Mandate is given through the cabinet decisions in 1994 and 1998.



JUPEM - National Repository Body For Underground Utility Data

- There is no single national repository body sanctioned by law to safely keep underground utility data. JUPEM (through cabinet decisions) is taking the responsibility of compiling and managing underground utility data from providers for the purpose of data sharing, thereby acting as a national repository centre.

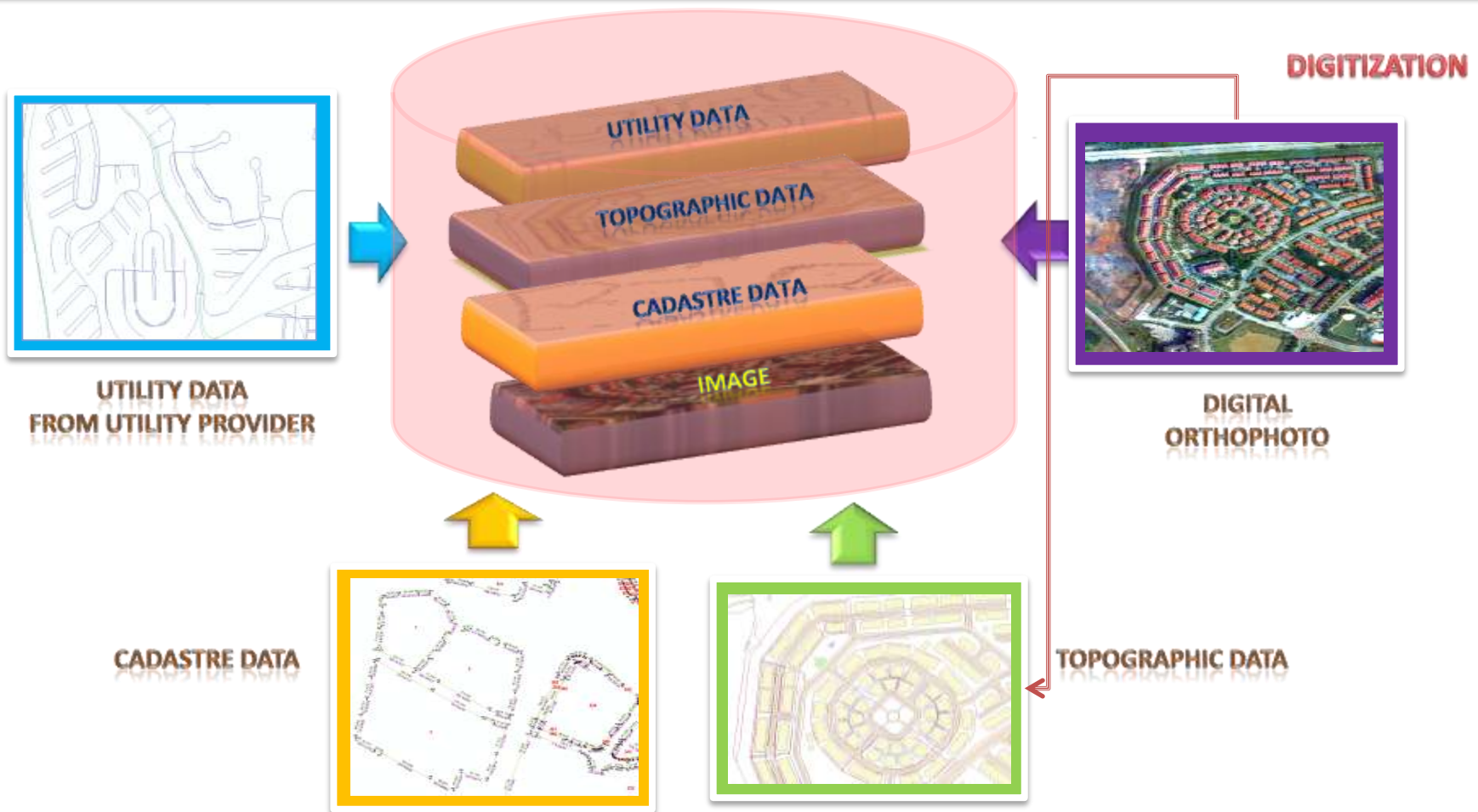
- **JUPEM's Initiatives**

- JUPEM established a Utility Mapping Division in 2006 with a workforce of 55 personnel.
- Develop National Underground Utility Database known as PADU.

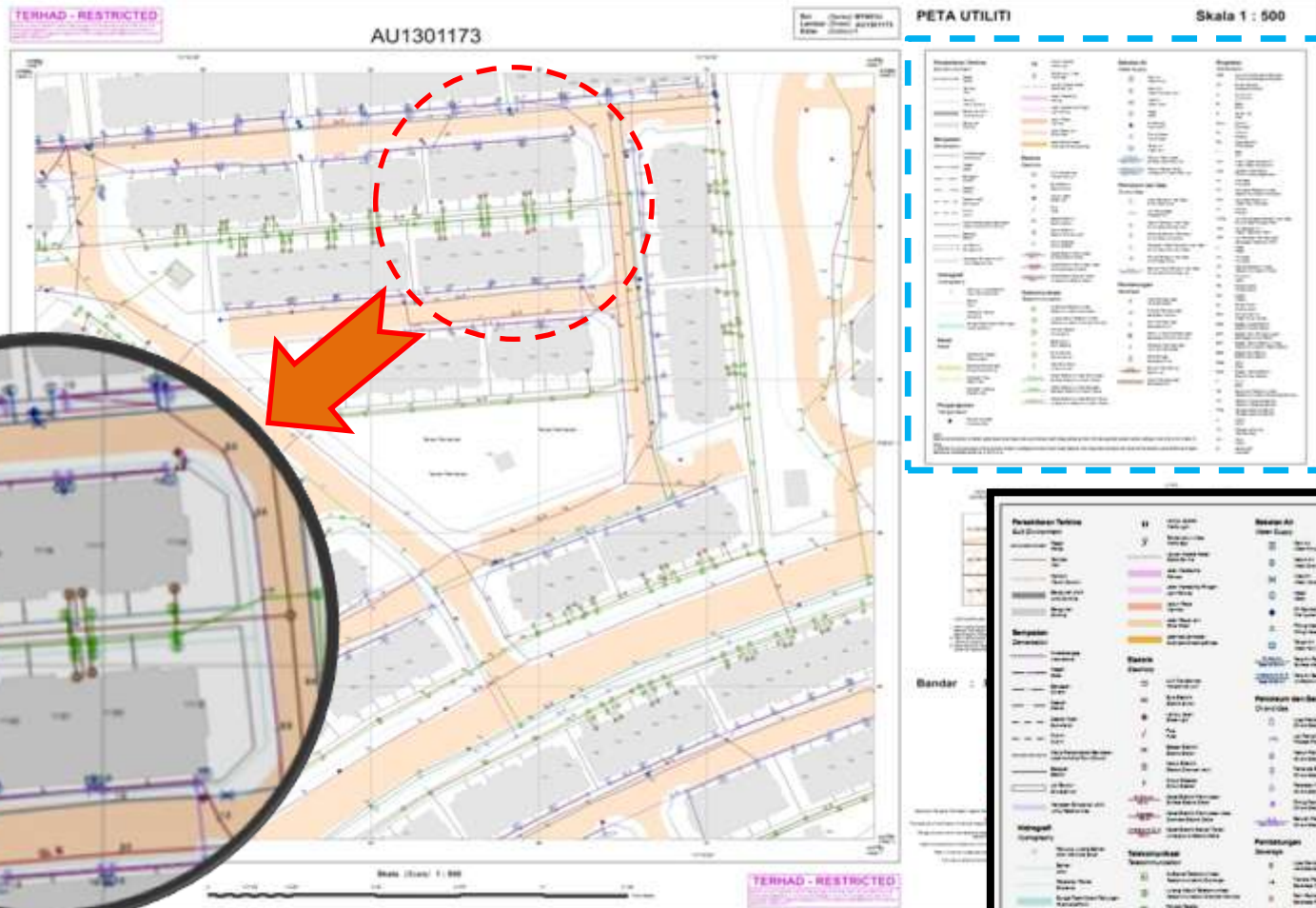


National Underground Utility Database (PADU)

- Seamless database consisting of 4 major components; 1:500 base map, cadastral data, utility data and imageries



Utility Map Produced By JUPEM



An 1:500 scale utility map showing position of utilities and important topographic features with centimetre accuracy

Managing Underground Utility Mapping Activities

- JUPEM collaborates with utility providers and related agencies to ensure an orderly management of utility data. This is done through several committees at national levels
- Formulation of Specification, standards and guidelines for Utility Mapping to allow standardization vital for data sharing.
- Several Circulars produced by JUPEM describing roles of stakeholder and techniques and practices for detection and underground utility surveying:
 - 2006 Guidelines for Underground Utility Mapping
 - 2007 Guidelines for utility surveying and detection
 - 2013 Guidelines for surveying of New Utility Installation





**ISSUES AND LATEST APPROACHES IN
UNDERGROUND UTILITY MAPPING IN
MALAYSIA**

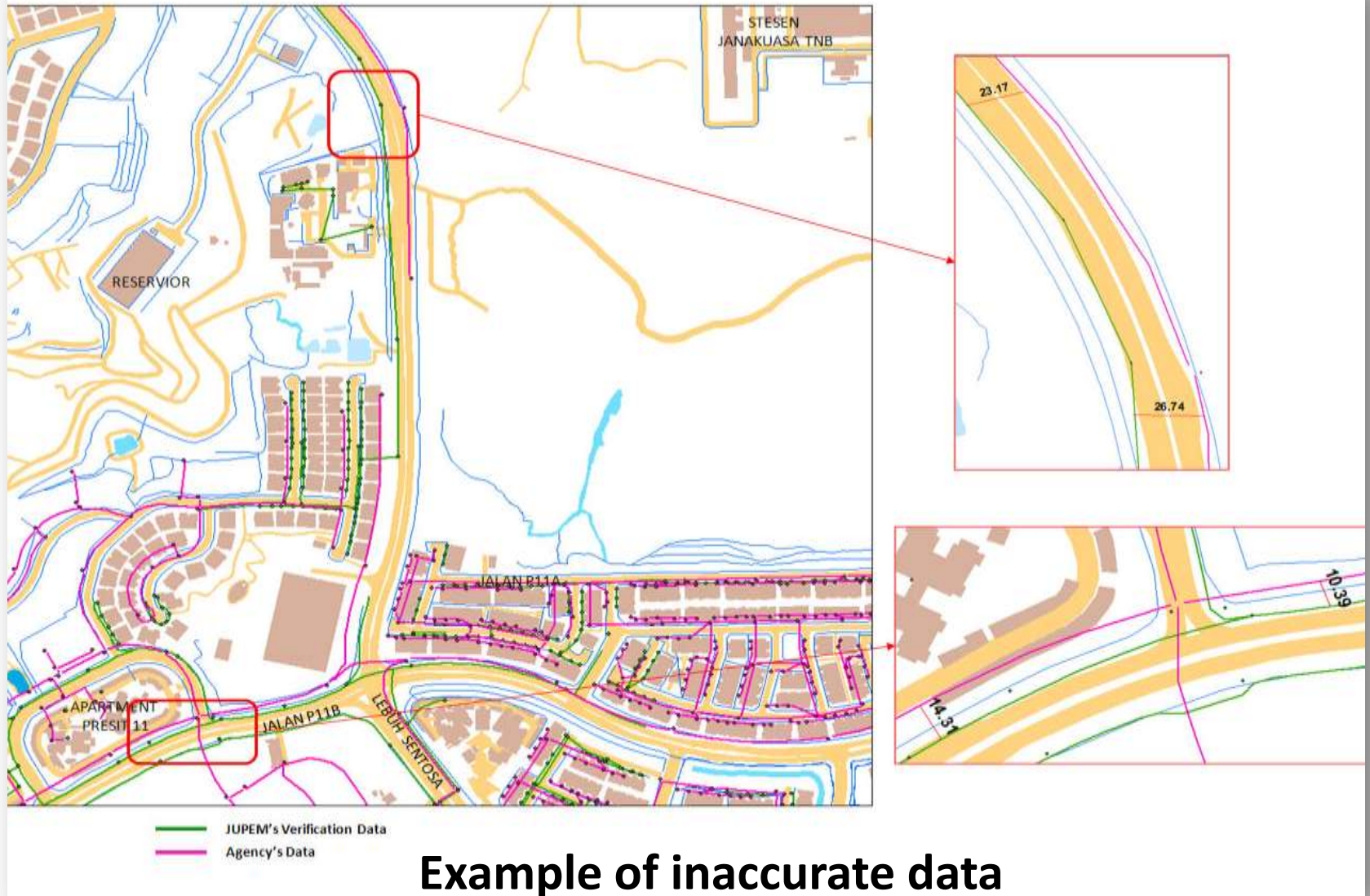
Quality Of Underground Utility Data

- Obtaining underground utility data from utility providers is not an issue where utility providers are willing to cooperate.
- However, obtaining **accurate data** remains the biggest challenge.
- Data quality varies based on owners specifications and requirements. Comparison made through field verification shows significant positional differences.
- Possible reasons - data kept comprise of proposed, design, schematics plans rather than as-built plans where survey are not required during installation or etc.

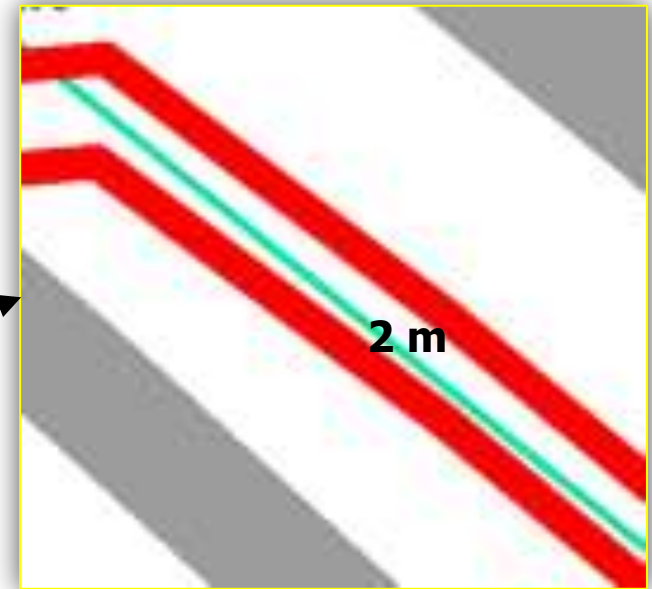
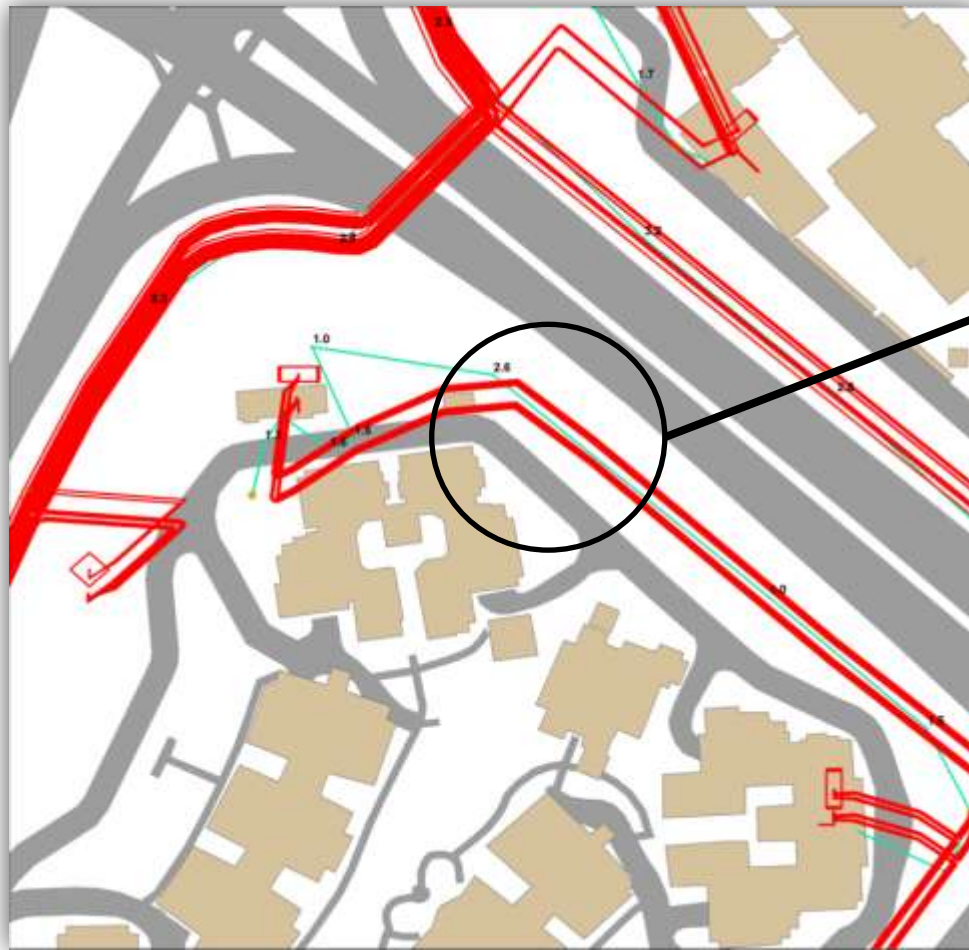
Regulatory Bodies And Legislation

- Regulatory bodies governing utility providers, for eg. are Malaysia Communication & Multimedia Commission (MCMC) and National Water Services Commission (SPAN), Energy Commission (EC) have own requirements and guidelines.
- However there is lack of legal requirement to provide sharing of utility data and data acquired are usually of low accuracy.





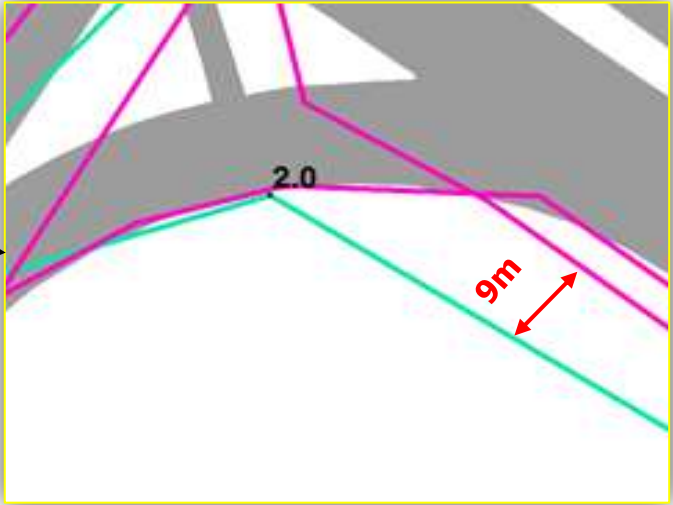
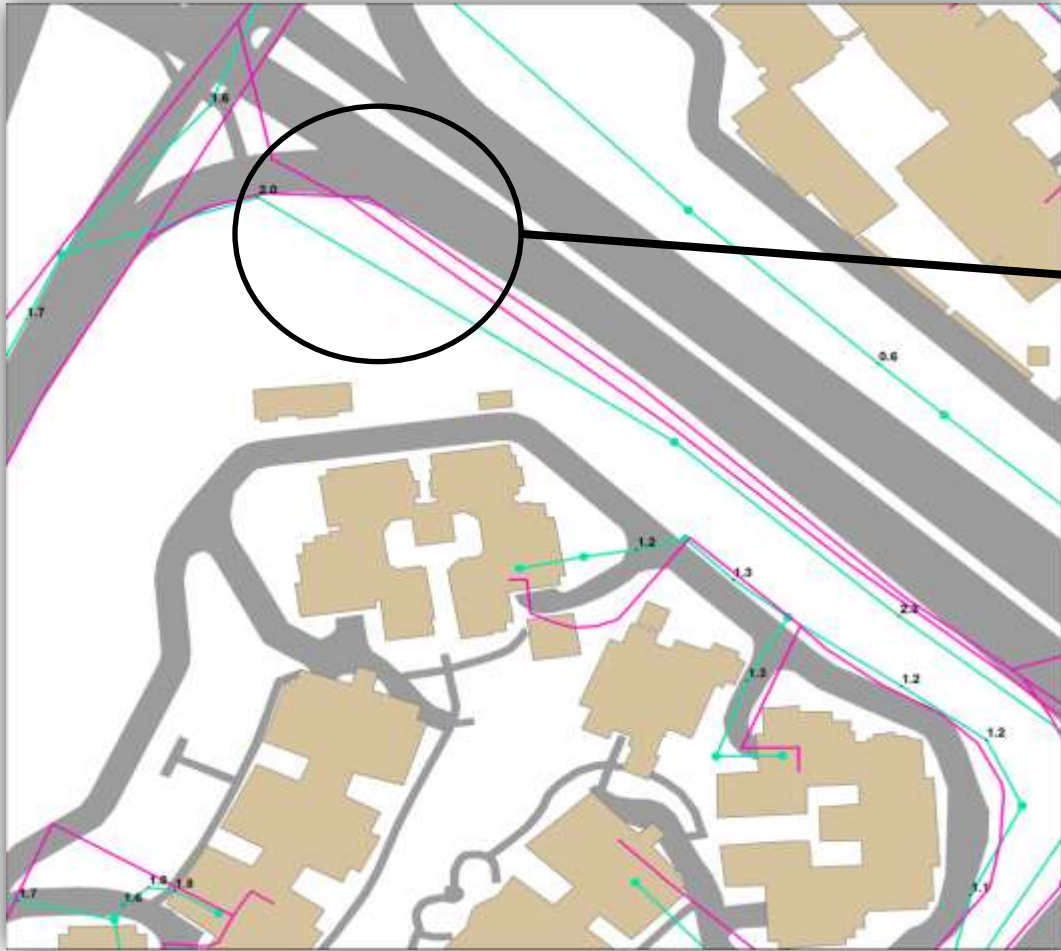
Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates large positioning differences and there are some major blunders in which utilities drawn on the wrong side of the road in some places.



-  **Data from utility provider**
-  **Data verified by JUPEM**

Example of inaccurate data

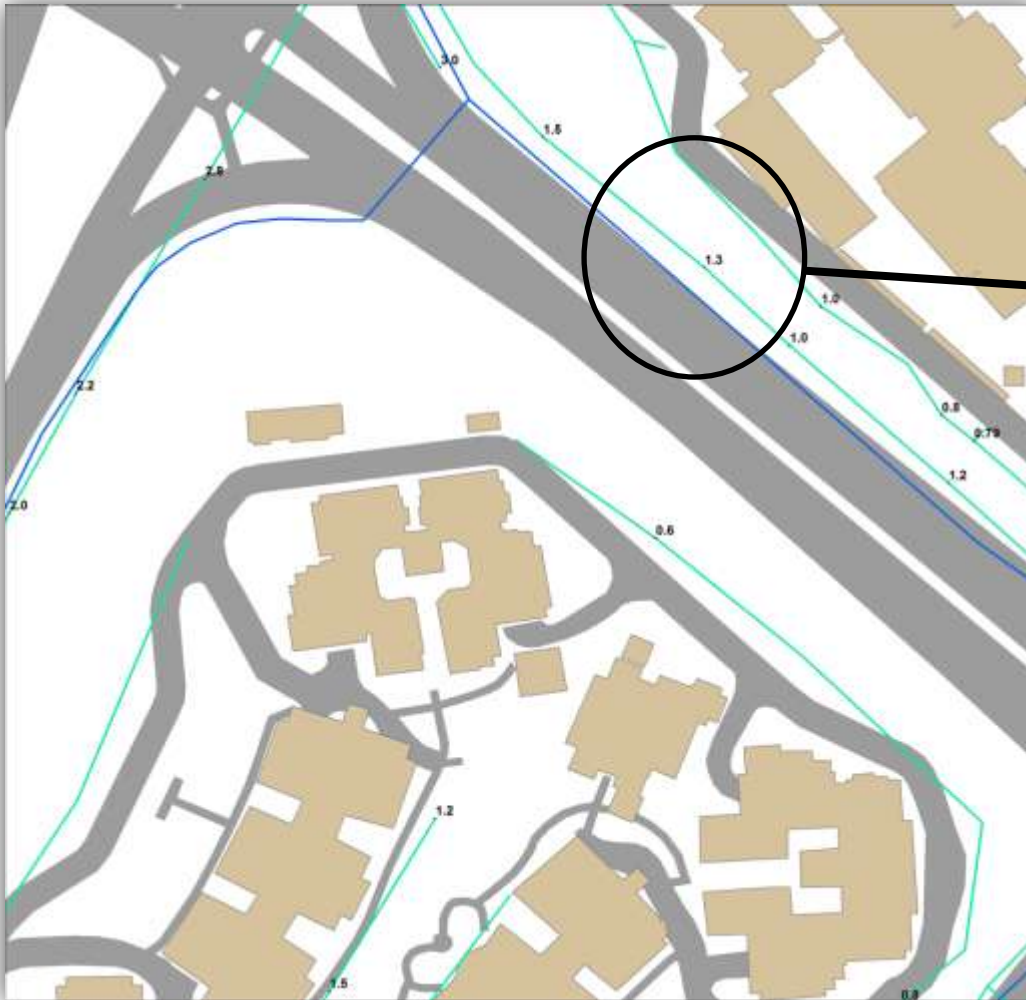
Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates a positioning differences of up to 2 meters in certain places



- Data from utility provider
- Data verified by JUPEM

Example of inaccurate data

Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates a positioning differences of up to 9 meters in certain places



- Data from utility provider
- Data pipelines verified by JUPEM

Example of inaccurate data

Comparison made between utility provider's data and JUPEM verified data on a 1:500 scale topographic map indicates a positioning differences of some 7 meters in certain places

NBOS APPROACH

- At the moment policies pertaining to underground utility are being set in isolation by respective Agencies and ministries.
- More engagements are required through NBOS approach to deliver rapid services at low cost.
- Collaboration with Departments within Ministry or Trans-Ministries through National or Working Committee such as:
 - National Mapping and Geospatial Data Committee
 - MyGDI Committee
 - Utility Mapping Committee
- Example of NBOS Trans-Ministries
 - JUPEM collaboration with Putrajaya Corporation
 - JUPEM collaboration with Ministry of Housing and Development.
 - JUPEM collaboration with Public Work Department

Latest Government Decision On Underground Utility Mapping

- No specific Act governing utility mapping. However power is given to the local government to impose condition necessary under Street, Drainage and Building Act 1974 but silent on mandatory requirement for utility mapping.
- A decision by the National Council for Local Governments (MNKT) on 18th September 2014 stated:
 - All new underground utility installed using open trenching must be surveyed during instalation.
 - An Accurate positioning method must be used when installing using HDD method.
 - Needs for engagement of qualified surveyors for surveying work and for producing digital utility data and as-built plan.
 - A copy of the digital data must be submitted to JUPEM for updating on PADU.
 - The above requirements to become part of the approval criteria for **new** Development Order.
- Translated into guideline (soft law) and condition set by local government such as submission of “as-built survey plan” upon completion of any project can become a good source for continuous updating.

Holistic Approach In Acquiring Accurate Underground Utility Data

- The MNKT decisions translated into guideline is a good example of NBOS policy for sustainable acquisition of accurate underground utility data.
- Guidelines provided by JUPEM to be implemented at Local Council level which is from a different ministry.
- Help mitigate loss of as-built data of completed development projects.
- Sustainable source of up-dated data for PADU
- Continuous up-dating of accurate underground utility data with the engagement of competent practitioners.
- A win-win situation for both JUPEM and Local Councils.
- JUPEM initiative – conducting roadshow nationwide to brief all states' legislatives on the new guidelines
- To date almost all states legislatives including local councils briefed.

Importance Of Accreditation And Role Of Qualified Land Surveyors (LLS)

- **IMPORTANCE OF COMPETENCY**

- Competency goes hand-in-hand with data quality
- LLS will be involved directly in:
 - Survey of newly laid utilities before they are covered.
 - Preparation of as-built plan (this will also include detected utilities if any).
 - Submission of plan to JUPEM.

- **ONE QUESTION REMAINS:**

Do we have enough well equipped players to serve the industry?

Competency Courses And Accreditation

- To mitigate the shortage of experts in Utility Mapping:
 - On-going short professional courses leading to certificate of competency in utility mapping is being conducted by Land Surveyors Board (LJT) for the licensed land surveyors yearly.
- Current number of Qualified Surveyors with competency certificate is approximately 79.
- Need to produce more at faster rate.

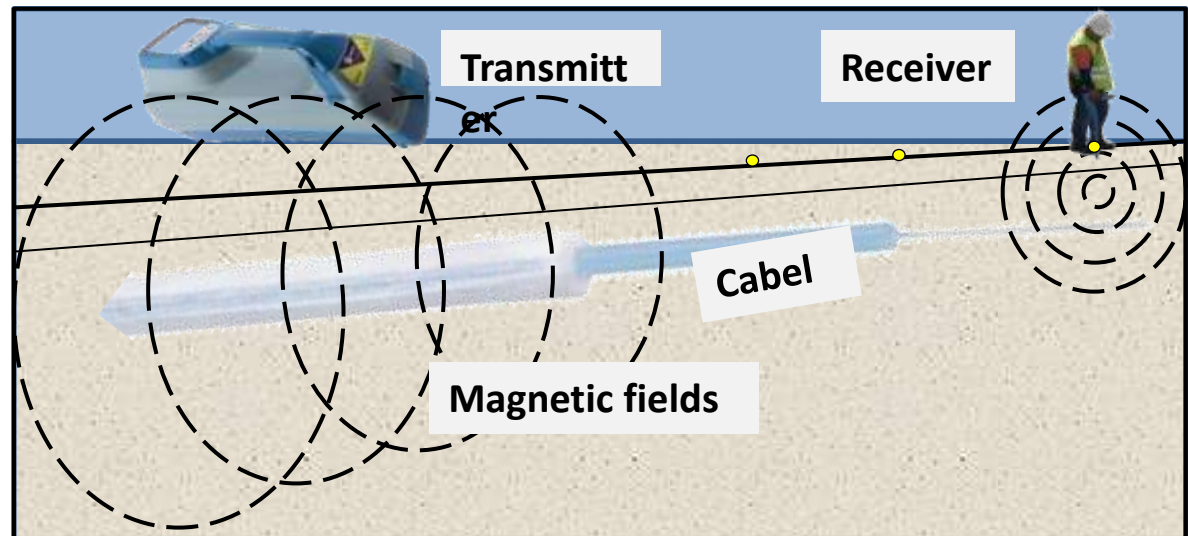


Technology In Underground Utility Mapping

- JUPEM and other utility players must keep abreast with latest knowledge on:
 - equipment for detection and surveying
 - techniques used and equipment limitation
 - existing laws and regulations.
 - requirement of health and safety under the Occupational Safety and Health Acts (OSHA, 1994) :

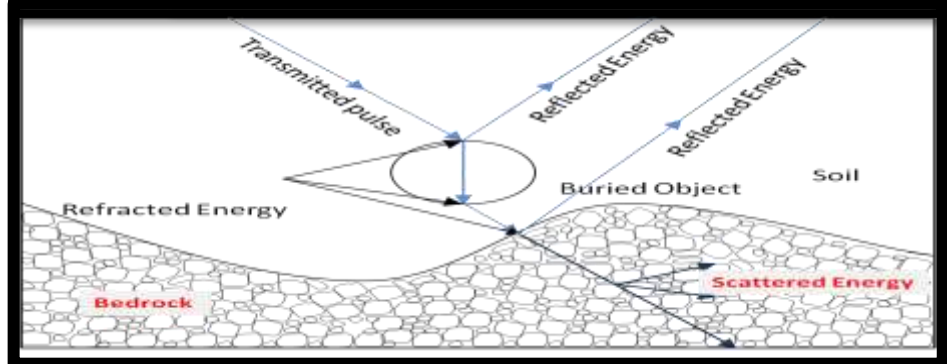
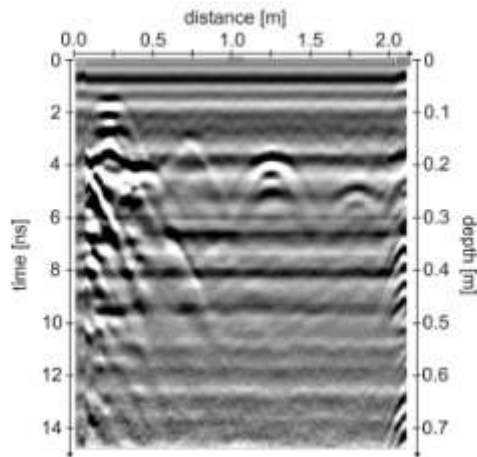
Equipment And Technology

- Better technology with better accuracy.
- The different type of detection equipment (EML) have its advantages and disadvantages in the form of:
 - Equipment Cost.
 - Capabilities and Limitations.
 - Size and weight.



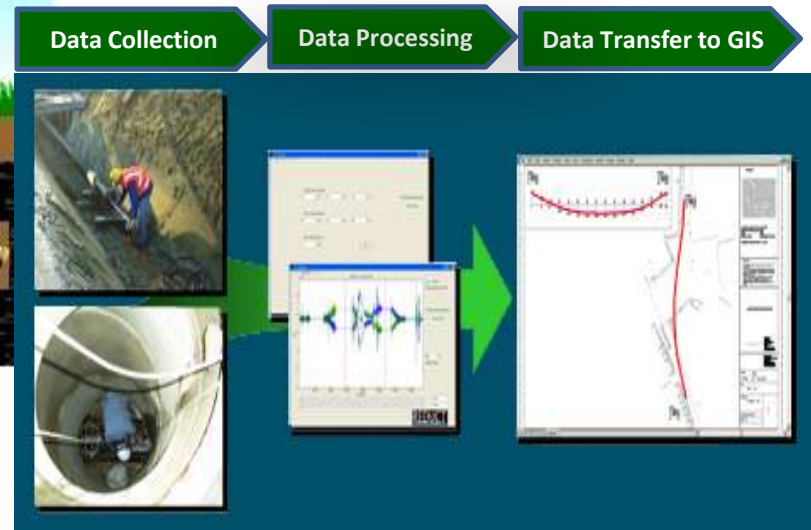
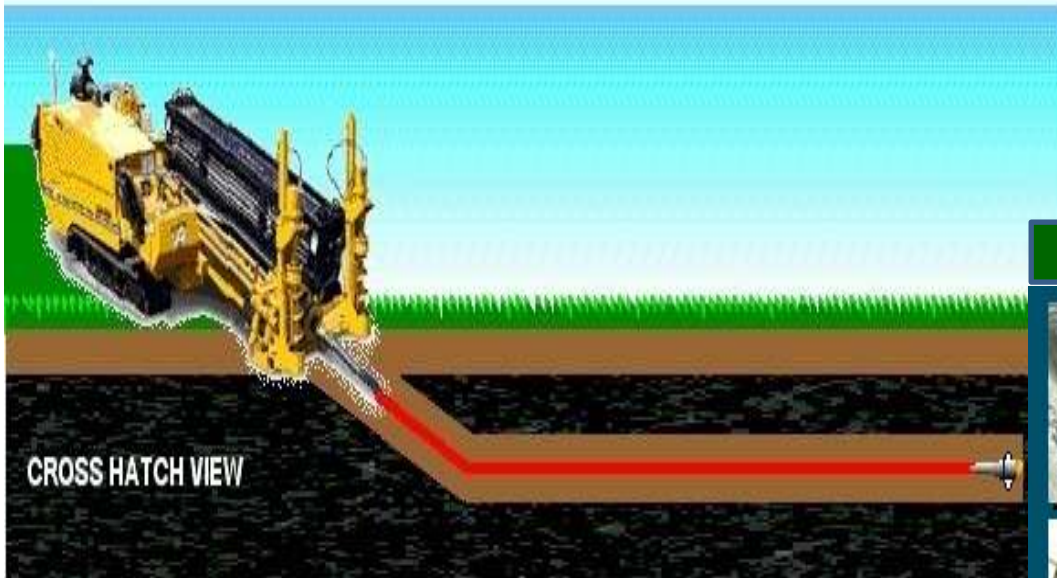
Ground Penetrating Radar (GPR)

- Introduction of better RADAR system capable of having broader bandwidth should be considered.



Gyro-based Inertial System

For detection of facilities installed using Horizontal Directional Drilling (HDD) a gyro-based inertial measurement system is recommended during the drilling or just before the utility is installed



JUPEM Strategic Planning Till 2020 and Beyond

- JUPEM Future strategic initiatives include:
 - Continuous study of system capability in line with changing and advancement of technology and the procurement of advance equipment.
 - To look into online data updating for stakeholders.
 - To develop smart-partnership with local agencies, create awareness and importance of standards and to review existing policy for data sharing.
 - To develop a single national policy for underground utility.
 - Continuous engagement with utility providers and stakeholders
 - Acquisition of accurate utility data from new development project.



Array Configuration of GPR



3D Utility Mapping

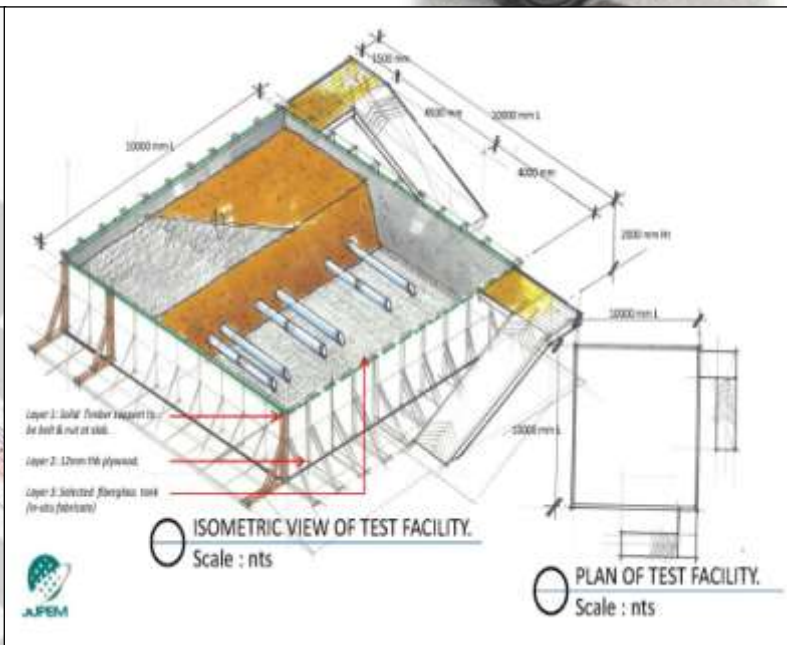
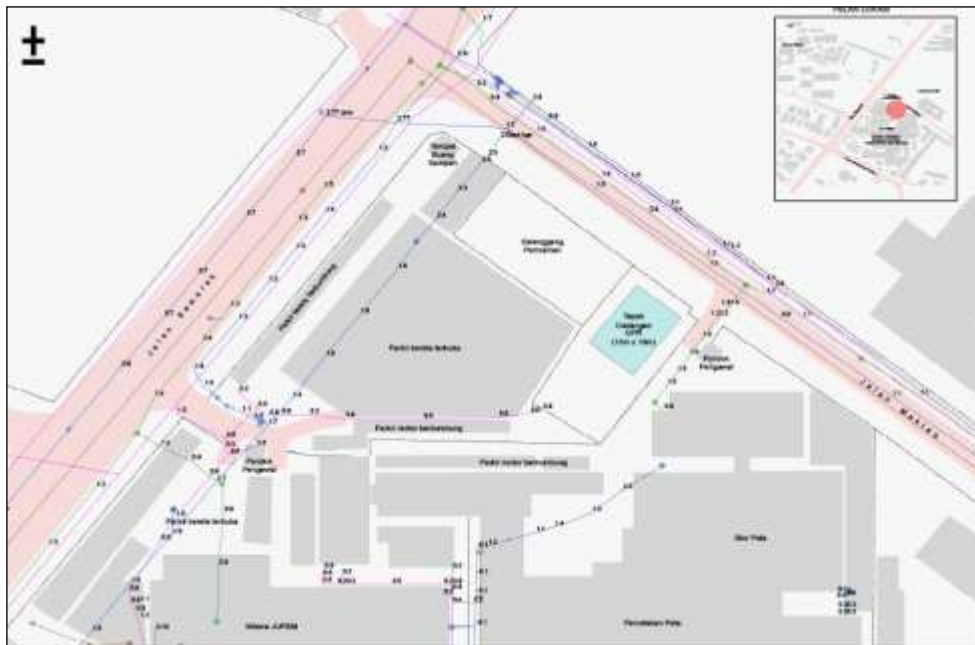
JUPEM is also looking into 3D mapping of underground utility

- To allow depiction from 3D perspective
- To allow integration with 3D above surface data for informed and intelligent decision making for planning purposes and etc.



GPR Test Facility

- JUPEM is building an indoor build-for-purpose GPR Test-base where equipment can be tested in a controlled environment to allow appropriate testing of GPR equipment necessary to maintain data accuracy



GOING BEYOND The KLANG VALLEY

- In the latest development, JUPEM is expanding its underground utility activities nationwide.



- The initial role of JUPEM at each state is to accept all as-built plan submitted by LLS, populate and manage the database at state level.
- This will be followed-up with capacity building with the expansion plan taken into account under the 11th Malaysia Development Plan (2016-2020)

CONCLUDING REMARKS



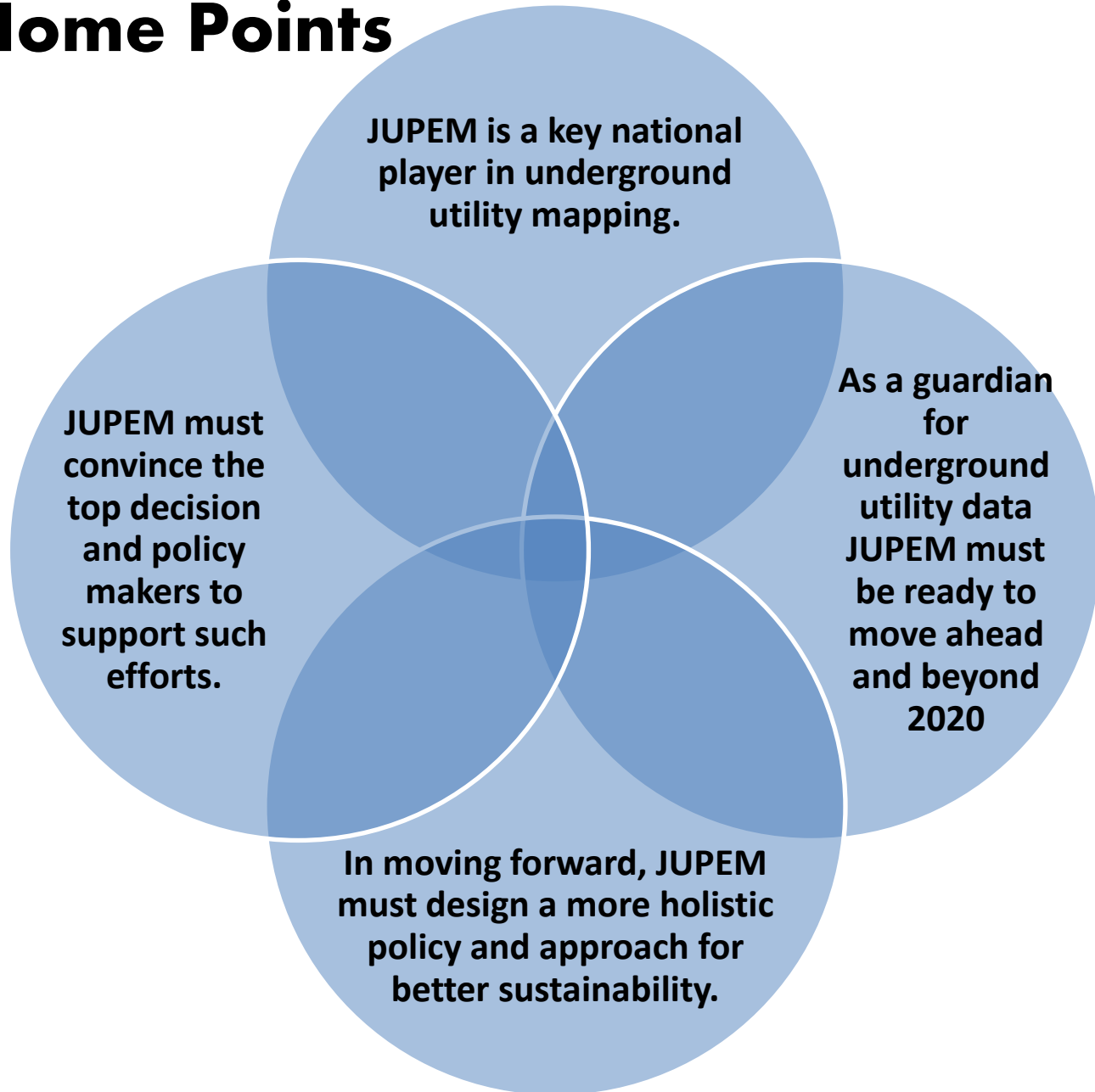
CONCLUDING REMARKS

- **National Underground Utility Database (PADU) is the National Data repository for underground utility.**
- **The decision by the National Council for Local Governments empowered local councils and allows JUPEM to obtain accurate and quality data from new development projects under the jurisdiction of Local Councils where:**
 - **All new utilities must be surveyed during installation.**
 - **A copy of the as-built plan forwarded to JUPEM for safe keeping and future references.**

CONCLUDING REMARKS

- **NBOS is the basis for current and future approach within and trans-ministries to obtain accurate underground utility data.**
- **Accurate and quality data obtained with the involvement of competent professional land surveyors as stipulated in the latest KPKT guidelines.**
- **To keep abreast with new technology to continuously improve productivity.**
- **JUPEM is spearheading utility mapping for the country with plans for nationwide expansion.**

Take Home Points





Thank you for your attention

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