



XXVI FIG CONGRESS

6-11 May 2018, İstanbul



BIM and Geomatics / GIS Integration – Malaysian and Turkish Perspectives

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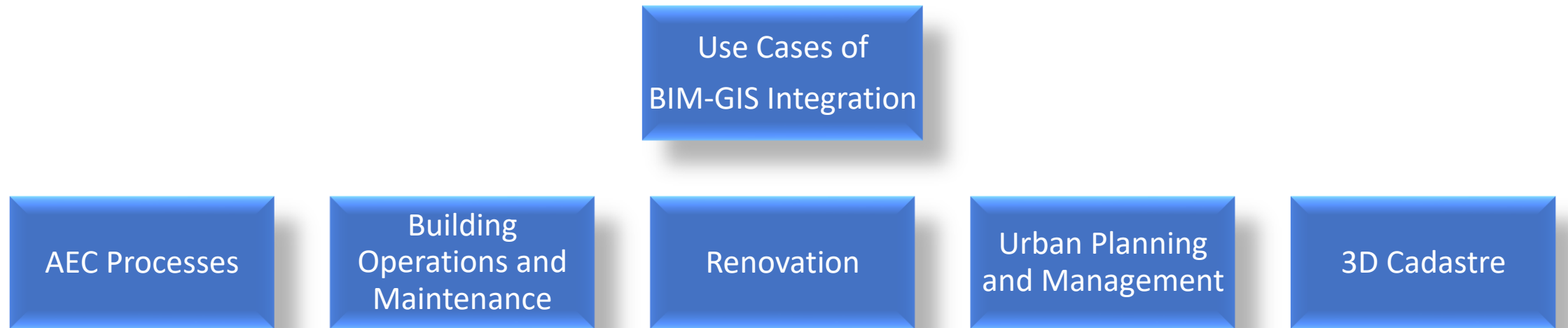
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A Use-Case Perspective on Integration



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Application Object	Building				
	Construction Phase	Planning and Design	Construction	Operation and Maintenance	Demolition
Year	2008	Site selection [72].		Fire response [72]; Web service [73]; Disaster scenarios [73].	
	2009	Climate adaptation [24].			
	2010		Urban renewal projects [82].		
	2011	Construction safety planning [85]; construction space planning [113].	Visualization of construction time control [114].	Existing buildings maintenance [83].	
	2012		Highway construction management [115].	Emergency response [61].	
	2013	Site selection of solar panels [84].	Visualization of construction supply chain management (CSCM) [15].	Indoor navigation [92]; heritage protection [93].	
	2014			Fire simulation and response [74]; heritage protection [94]; large building operation [98].	
	2015	Building design and preconstruction operations [86,87]; building energy design [89,90].		Facility management [118]; indoor emergency response [75]; heritage protection [95,96].	Construction waste processing [119].
	2016	Building design [88].	Urban renewal projects [122].	Flood damage assessment and visualization [76–78]; indoor emergency response and route planning [16–18]; hazard identification and prevention [79–81]; heritage protection [22,23]; ecological assessment [25].	
	2017	Lift planning of disassembling offshore oil and gas platform [91].	Resilient construction supply chain management (CSCM) [97].	Management of property interests [124].	

AEC Processes

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AEC Processes

- Site Selection/Location planning
- Site Suitability/Alternatives analysis
- Site circulation/parking/vehicle routing
- Permitting/zoning review
- Visualization
 - Building Skins
 - Textures
- View Shed analysis
- Drainage analysis
- Erosion control analysis
- Height analysis
- Airspace encroachments
- Shadow analysis (solar potential)

- Security planning
- Evacuation routing
- Temporal Analysis
 - Historical
 - Existing
 - Future
- Economic Analysis
- Demographics
- Soil Conditions
- Transportation
- Source locations of building products (LEED analysis)
- Emergency Management/Security
- Total Cost of Ownership/Lifecycle Analysis

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Building Operations
and Maintenance

- IoT Perspective
 - GIS-based Facilities management (3-D models & Real-Time Information)
 - Energy Management
 - Real-time sensor display
 - Environmental contaminant analysis
 - MEP Systems Observation(with real time information)
- Indoor Modeling Perspective
 - Way-Finding
 - Proximity/routing
 - Interior Space analyses
 - Areas (organizational, operations, leasing, etc.)
 - Elevation
 - Volumes
 - Space Management/optimization(navigable/non-navigable spaces)
 - Indoor Asset management
 - Public Safety Perspective
 - Security
 - Fire protection
 - Evacuation routing
 - Hazardous materials storage

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Renovation

- Easy access to...
 - As-built architectural/structural models
 - As-built MEP/data networks

Urban Planning and Management

- 3D City Modeling
- 3D City Visualisation
- Urban Renewal Projects
- Urban Facility Management(road maintenance,urban design)
- Urban Infrastructure Modelling/Management(Tunnels,Underground...)
- City Level(Noise Analysis,Energy Assesment and Management,Flood Modeling)
- Emergency and Crisis Response(Fire,Bomb Attacks,Disasters)

3D Cadastre

- Registration of Rights,Restrictions and Responsibilities through utilising 3D representations

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A Technical Perspective on Integration: BIM-Geoinformation Models

Model Transformation

- IFC→CityGML
- CityGML→IFC

Model Harmonisation/Extension

- IFC→Harmonized Model File / DB
- CityGML→Harmonized Model / DB
- Extend CityGML with ADEs

Portal Level Integration

- Acquire BIM from a BIM Server DB / or file
- Acquire CityGML model from a 3D City DB / or file
- Create a visualisation in Cesium

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Barriers of Integration: BIM-Geoinformation Models

Differences in 3D Representations

- CSG/Sweeping/BRep
- BRep/Voxel/TIN

Differences in Semantics

- BIM has more detailed semantics regarding building elements
- Differences in classes and their meaning(i.e. Wall)

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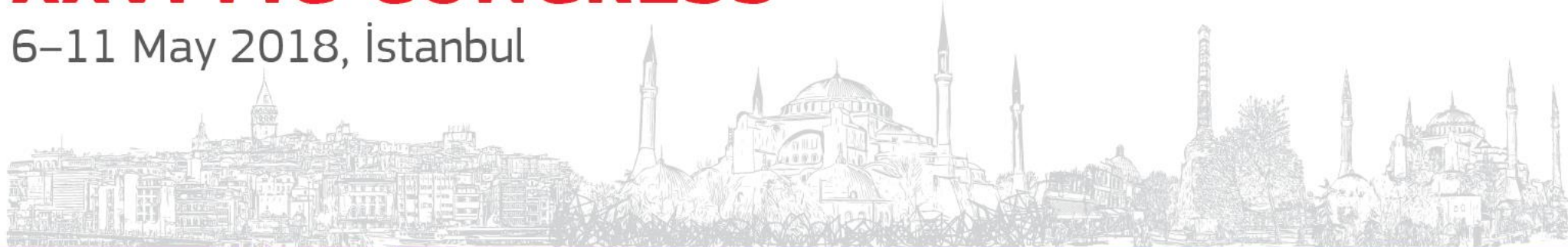


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The Malaysian Perspectives

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BIM and Geomatics Integration – Current Status

- Building Information Modelling (BIM) as 3D data source.
- Authorities (CIDB, JUPEM, PEJUTA) are working towards a policy and regulations.
- Near-future “BIM-compliance” for all 3D data collections, modelling, and submission tasks.

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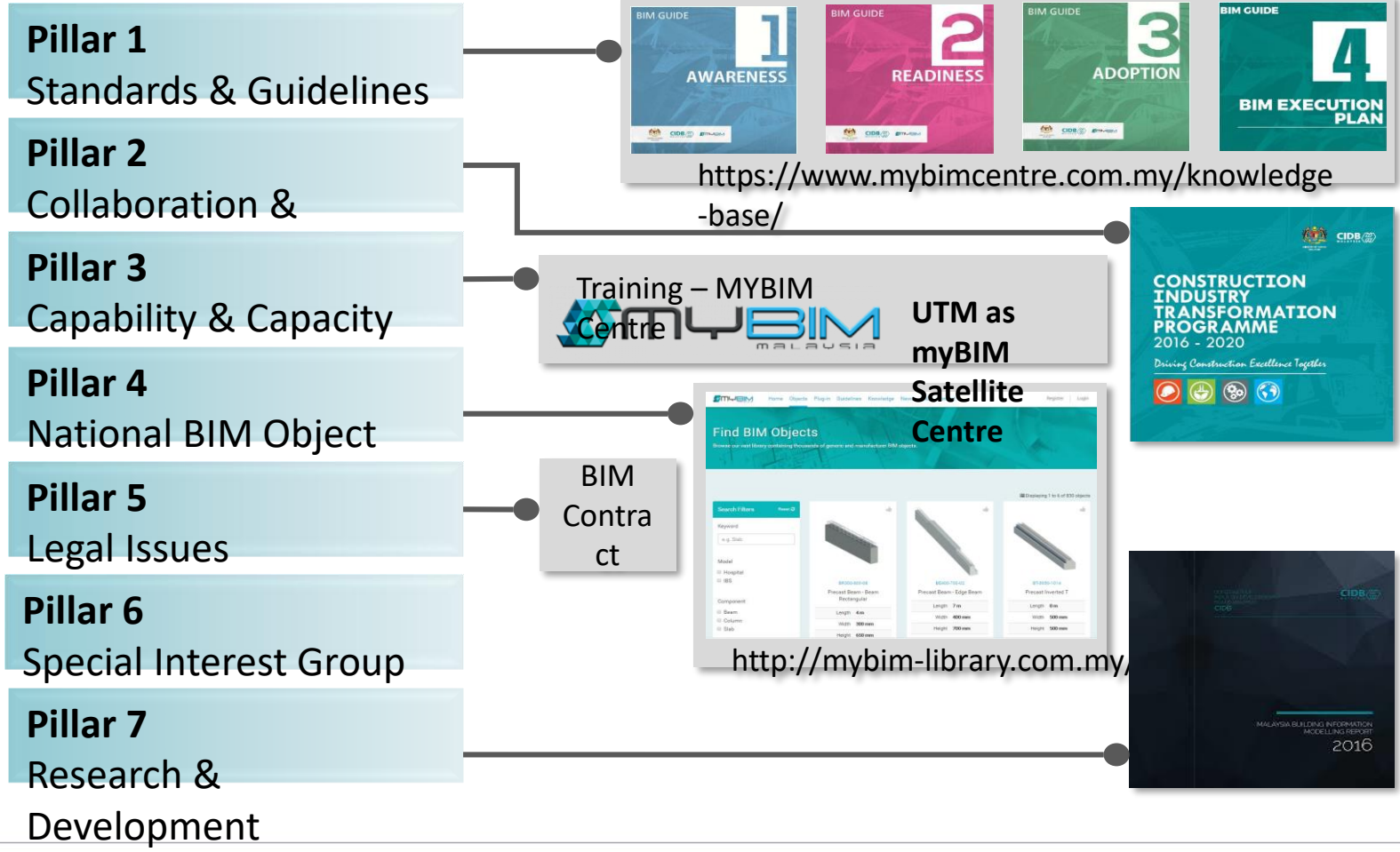


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Construction Industry Development Board National Building Information Modelling (BIM) Roadmap 2015 – 2020

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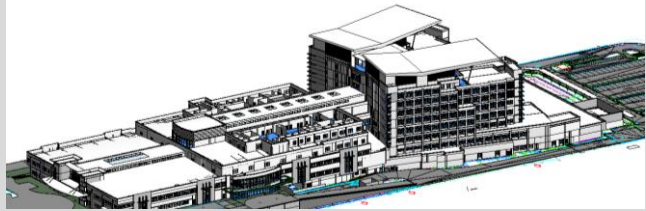
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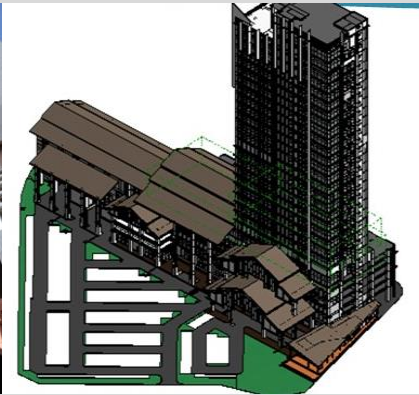
Embracement of BIM by Public and Private Sectors

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BIM Pilot Projects by Public Works Department



National Cancer Institute, Putrajaya



Kuala Terengganu City Council

Private Sector



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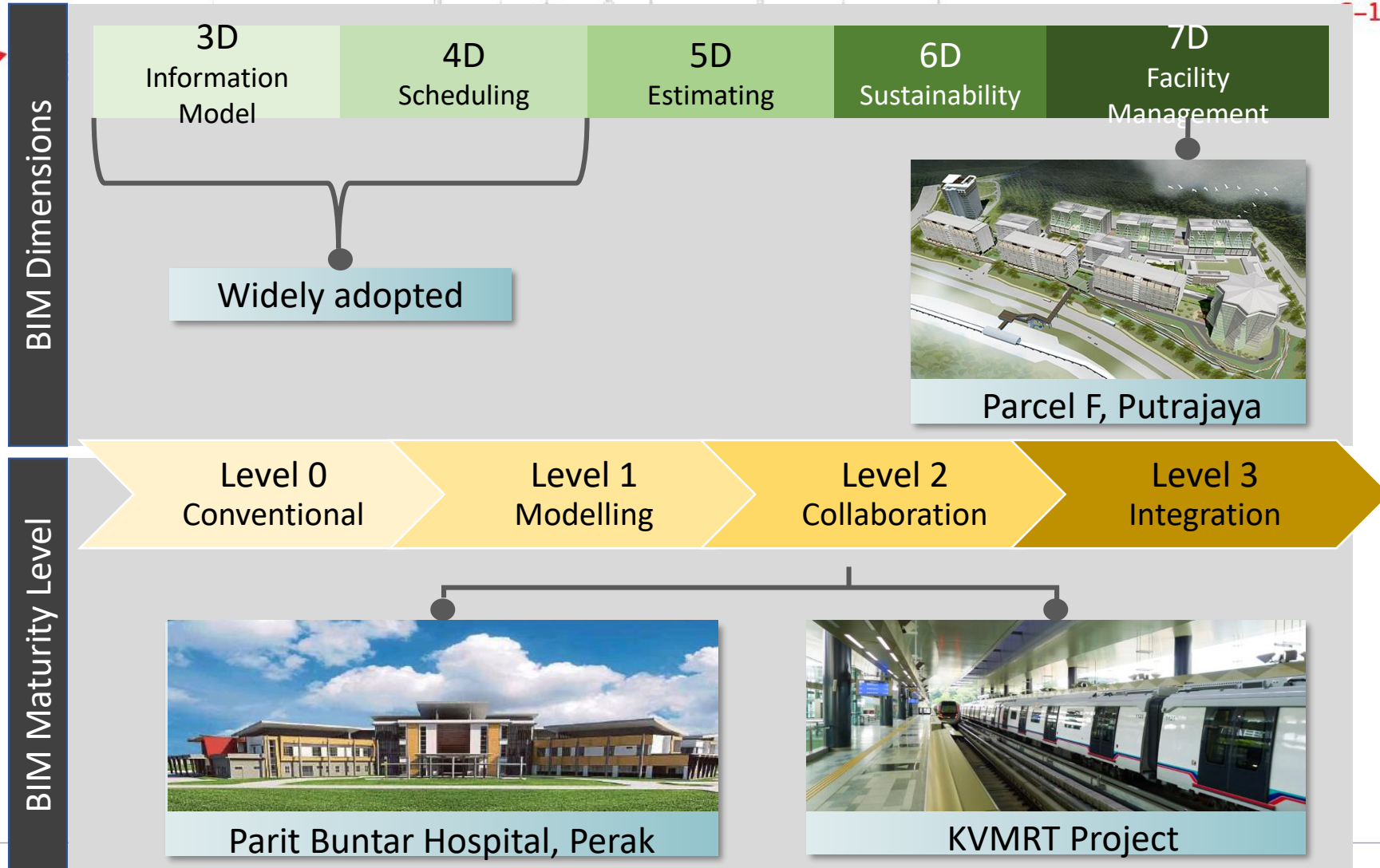


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Current State of BIM Projects in Malaysia

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The Turkish Perspectives



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BIM in Turkey

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- Turkish AEC companies implement BIM in their projects
 - Many design offices use BIM for design collaboration and coordination between various disciplines
- The contractors use BIM to track and manage their construction processes in their projects in Turkey and Abroad
 - Key public projects include...
 - Istanbul NewAirport project (IGA)
 - M7 Underground Line Construction project of Greater Municipality of Istanbul (Metro Istanbul)

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Building Information Models
will serve as data sources in the new large-scale
3D City Modeling Project
of
General Directorate of Land Registry and Cadastre

The following slides will elaborate on
3D City Modeling Project in detail.

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3D CITY MODELING & CADASTRE PROJECT



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THE AIM

Aim of the project is to generate **3D City Models** using **oblique aerial images** and create **3D cadastre infrastructure** for Turkish Cadastre

These **3D City Models** will form the geospatial-information infrastructure for other public organisations.

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AERIAL OBLIQUE IMAGES

Oblique airborne images are captured using a five camera system one in nadir and the four cardinal oblique directions (east, west, north, south). Tilt angles of **oblique cameras** lie between 40° and 45°.

The camera system captures a minimum of **12** and a maximum of **36 images** for every point. The average flight altitude is 1000m., the nadir images has 8-10cm and oblique images has 10-15cm of resolution.



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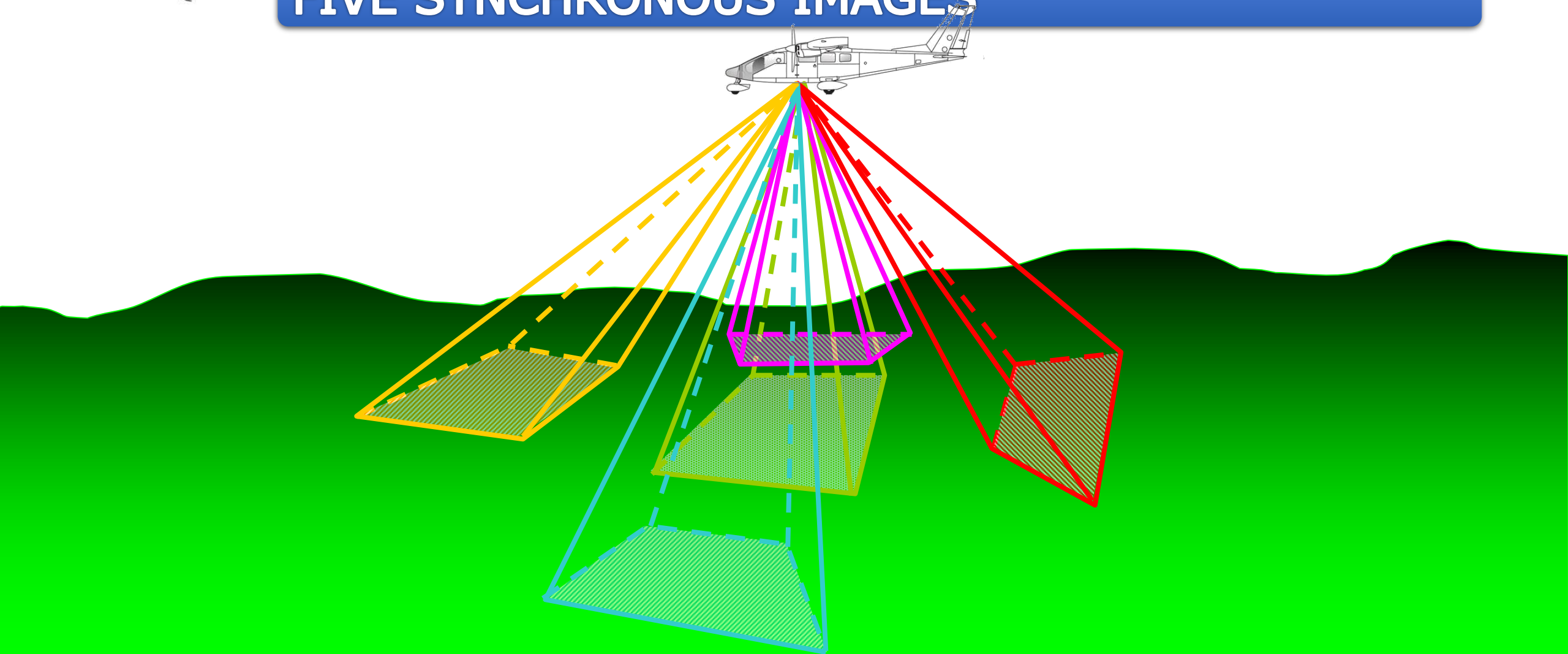




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FIVE SYNCHRONOUS IMAGES





PROJECT CURRENT SITUATION

- A Protocol has been signed between General Directorate of Land Registry and Cadastre and General Directorate of GIS for «Cooperation for Development of High Resolution Geo Imaginary »
- A pilot study of oblique image capture has been completed in Gölbaşı area at 9.Feb.2018.
- Oblique images were taken from the area covering 50 square-kilometres.
- 3D City Models has been created from oblique images

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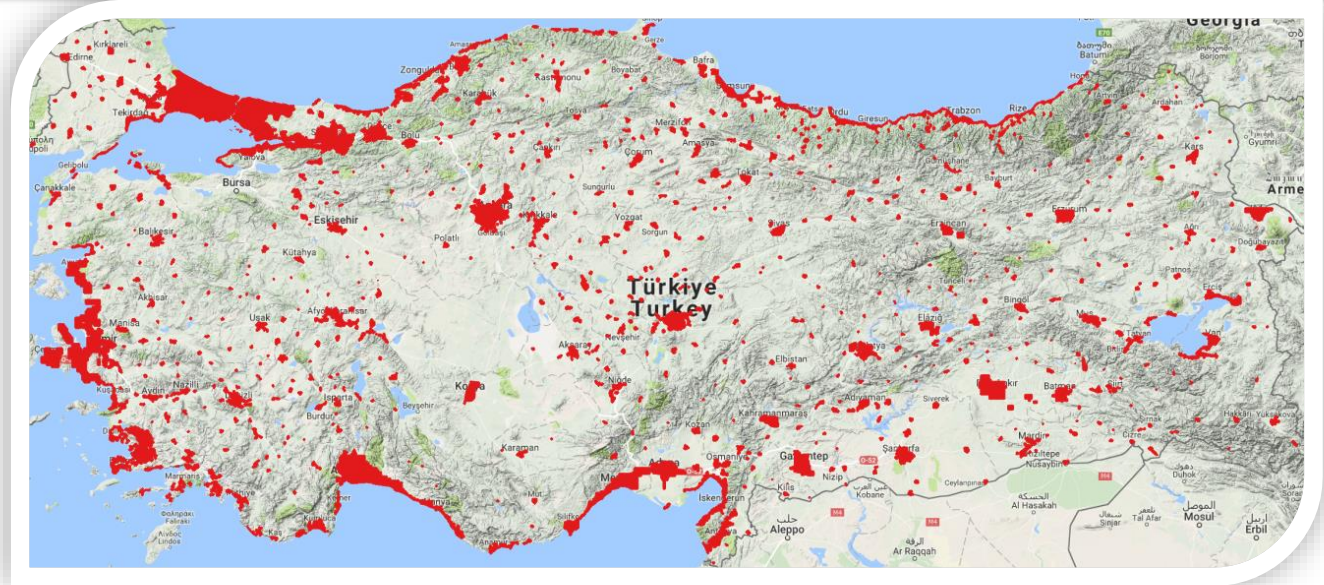


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PROJECT COVERAGE and TIMELINE



- 3D City Models&Cadastre Project will cover all urban areas in Turkey which is **40K Km²**.
- 3D City Model Production will be completed in **3 years**.

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CITY GML

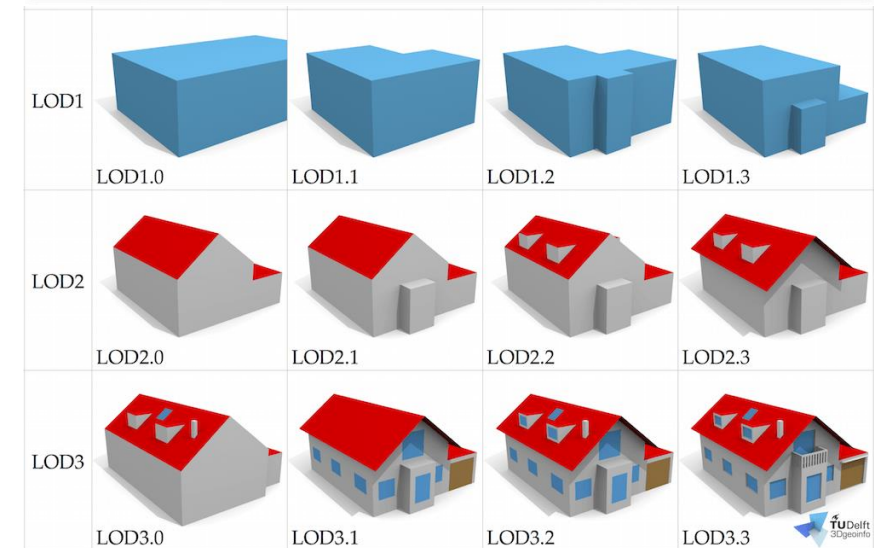
CityGML is an open standardised data model and exchange format to store digital 3D models of cities and landscapes.

CityGML is an official OGC standard.

CityGML defines different standard levels of detail (LODs) for the 3D objects, which allow to represent objects for different applications and purposes.

Figure illustrates...

Standard LODs of CityGML 2.0
Proposed LODs



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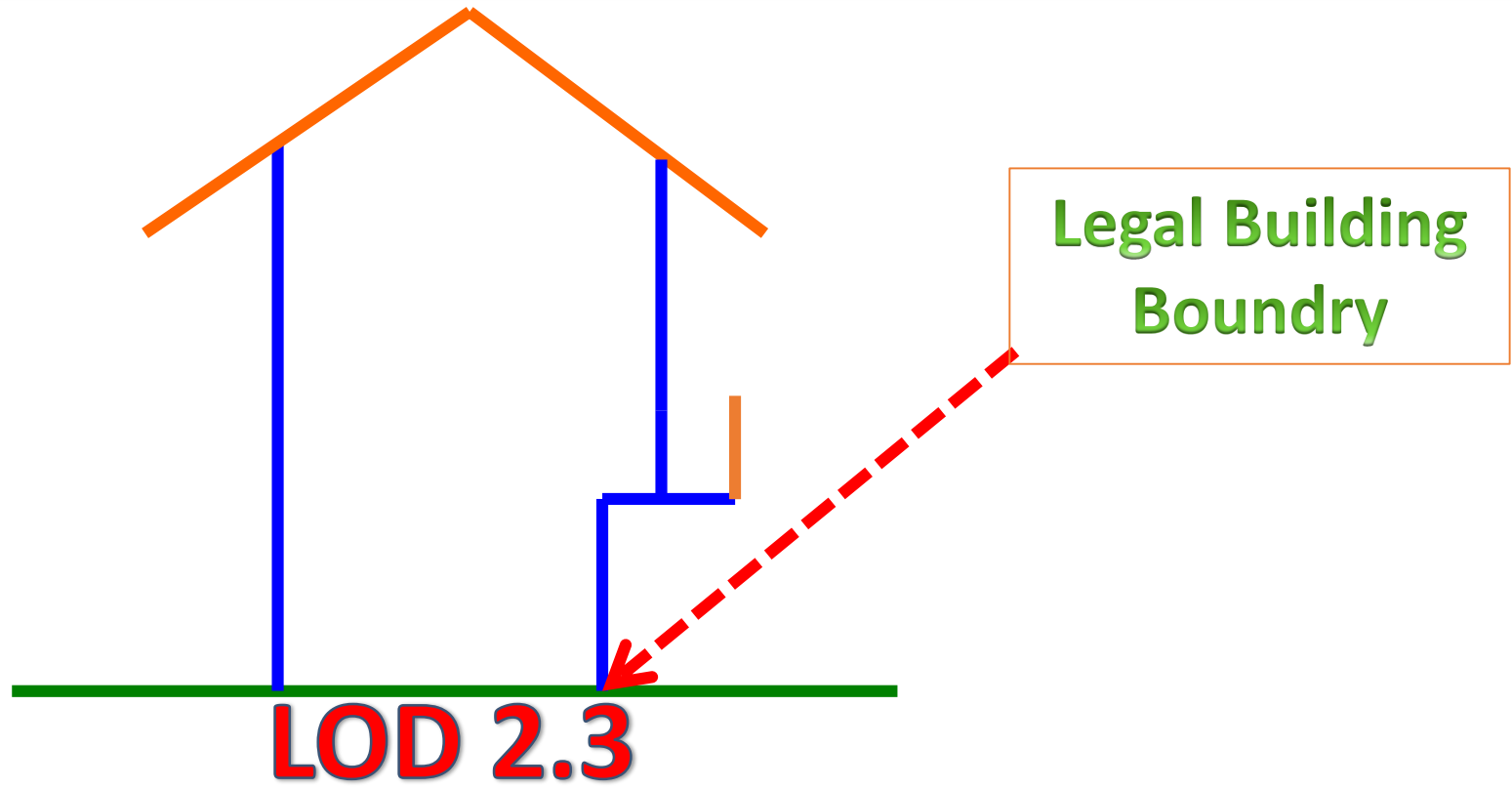
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3D CITY MODELS FOR 3D CADASTRE



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POTENTIAL USERS OF 3D CITY MODELS



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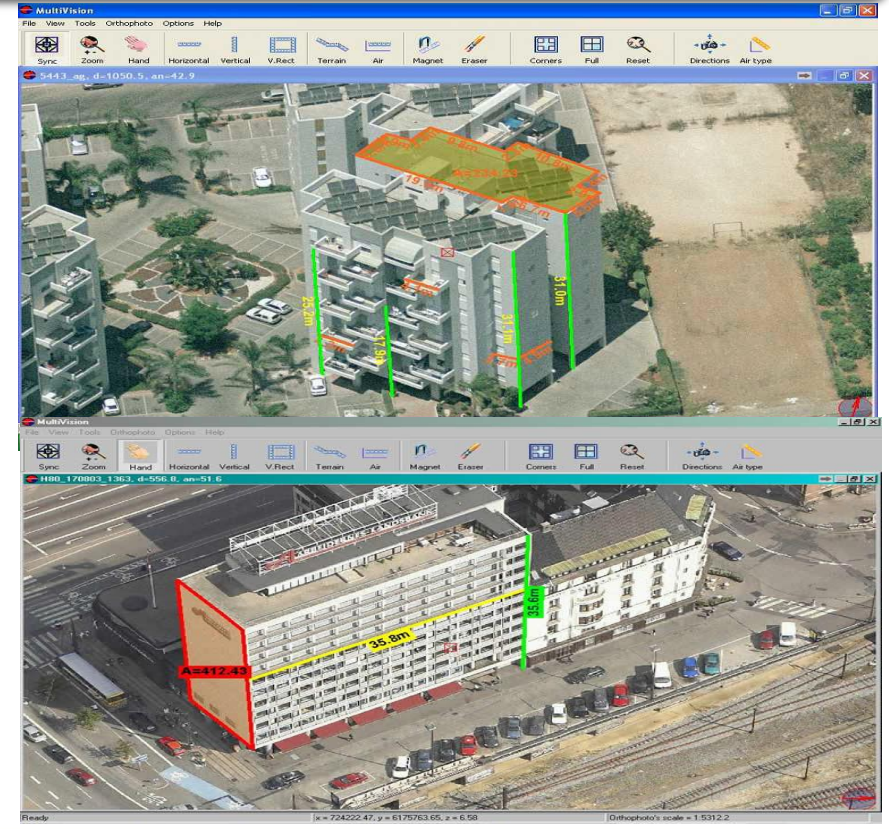
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REAL ESTATE VALUATION

- detailed/accurate measurements in 3D (such as height of floors)
- impact of surrounding structures/buildings and environment/city objects and vegetation
- visibility analysis and daylight analysis
- supports the automation of valuation processes



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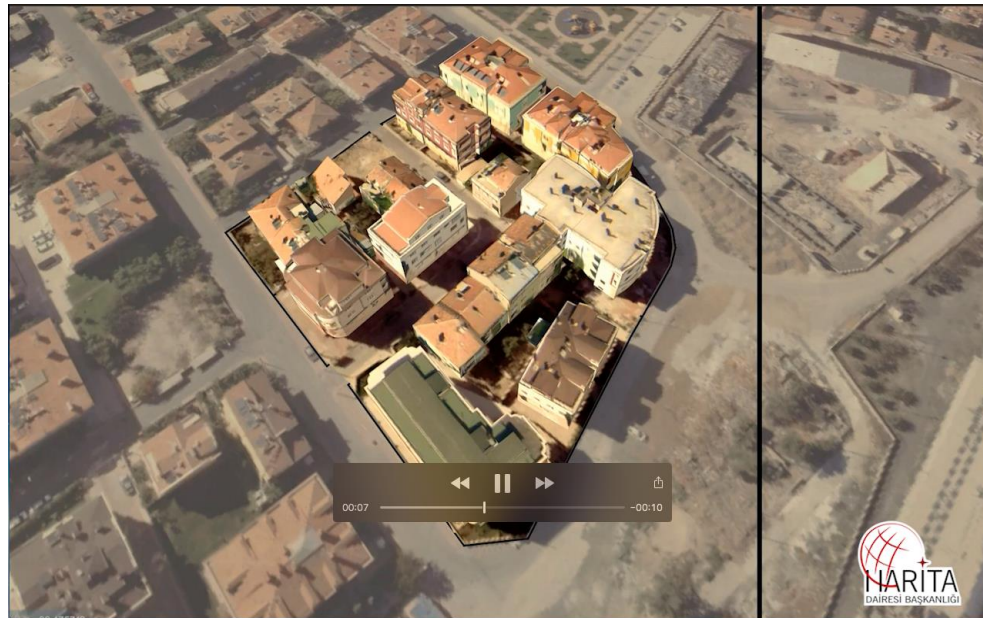


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3D CADASTRE

Rights, Restrictions and Responsibilities are accomplished not only on 2D parcels but also utilising 3D representations of the spatial units.



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3D CITY MODELS INTEGRATION WITH CADASTRE

- 3D City models will be integrated with existing 2D Cadastre database
- BIM is an essential tool for monitoring condominium rights.
- Existing CAD building plans will be used
- Existing hardcopy buiding plans will be digitized ...



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AWARENESS, METHODOLOGY, SUSTAINABILITY

- Awareness meetings with, users and potential contractors
- 100% of aerial image acquisitions will be done GDLRC
- 5% of 3D City Models will be produced by GDLRC staff and 95% will be contracted.
- 3D City models will be updated every 3-4 years
- 3D City models will be shared with other Institutions

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Tapu ve Kadastro
Genel Müdürlüğü

3B KADASTRO ÖN ÇALIŞMASI

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Thank you!

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