



National Technical University of Athens
School of Rural and Surveying Engineering
Department of Topography

A tool for affordable housing development

Dr. Chryssy Potsiou, Ass. Professor of Cadastre and Land Management

Dr. Charalabos Ioannidis, Professor of Photogrammetry

Sofia Soile, Rural & Surveying Engineer, MSc, Researcher

Styliani Verykokou, Rural & Surveying Engineer, PhD Candidate

19-20 September 2016, Athens, Greece

**Workshop on Sustainable Real Estate Markets
Policy Framework and Necessary Reforms**



Need for Land Readjustment

We are expected to provide solutions:
functional, reliable, affordable, inclusive & fit-for-purpose

to satisfy a world that cannot wait!



Urban land readjustment

Self financed & small projects

Voluntary participation

Fair property valuation & redistribution of property rights

Involvement of the private sector

Affordable housing provision

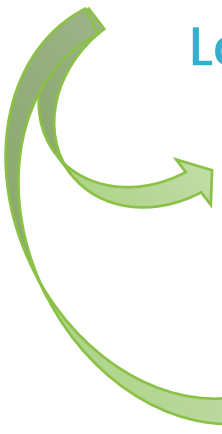
Increased urban densities

Best Use of Urban Land


Affordable Housing

encompasses a wide spectrum of housing types, prices and occupants

- Rental housing
- For-sale housing
- Government-subsidized housing
- Public social housing ?
- Policies usually speak of affordability as:



Low-income rental housing: Subsidies for production or for occupants (object grant/subject grant) or both to make it affordable to low- (50-80% of median income) and very-low-income (50% of median income) households



Affordable ownership housing: market-rate unsubsidized housing for moderate-income (80-95%) households, first-time buyers, and subsidized ownership housing for low- and moderate-income buyers

Characteristics of the Technical Tool

serves the need for **small-sized** urban land reforms, especially through **readjustment of property rights** within urban areas

achieves the “**best use**” of land and allows for **energy saving** improvements and **inclusive planning for affordable housing** provision

serves both **public and private sectors**

applicable in **various geographical regions** (e.g., developed and developing economies/markets, formal and informal urban settlements)

serves various **self-financed, small land management purposes**, various **land policies and land reforms** with **voluntary participation** of citizens and the private sector, with great **transparency**

General Framework

3D modelling of the existing situation at different Levels of Detail (LoDs)



Valuation of Properties

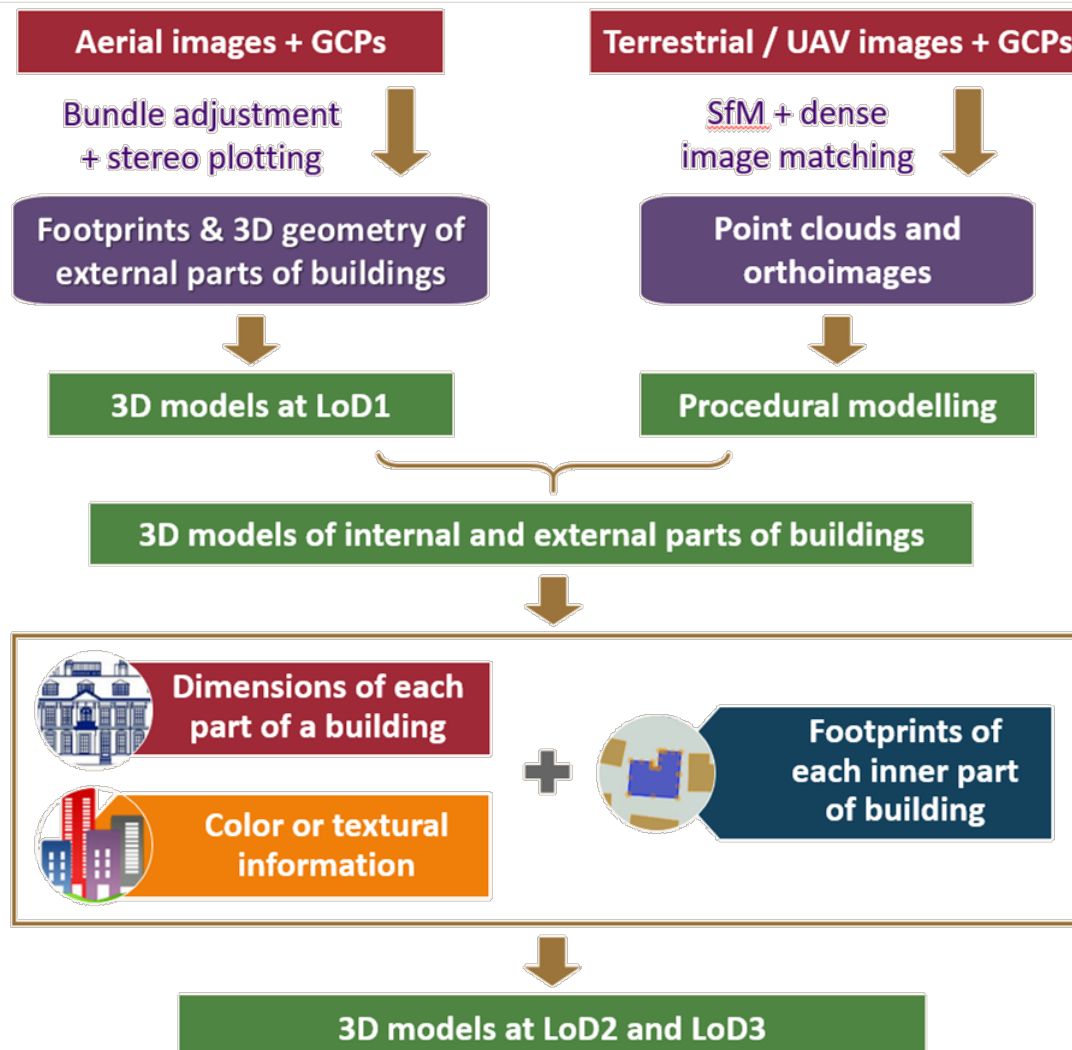


Metadata enrichment – Cadastral database



Readjustment of property rights and affordable housing scenario

3D Modelling at Different LoDs



Valuation of Properties

Estimation of the **Market Values** of the subject properties

- in accordance to the rules and guidelines of the **International Valuation Standards (IVS)**, Standard 1
- taking into account the principle of the **“highest and best use”**
- taking into account their **current** and their **potential condition**, assuming vacant possession

various methods, e.g., **Sales Comparison Method**, **Residual Method**

- an **inspection** has to be carried out in the field
- a thorough **market research** has to be carried out, in order to determine all the critical factors that affect the value of the properties, like **property market trends**, **demand and supply for residential units in the area**, **sale duration**, **vacancy rates** etc.

Readjustment of Property Rights & Affordable Housing Scenario

- determination of the **appropriate blocks of plots** for the implementation of the regeneration scenario;
- informing the property owners about the **benefits and the incentives** of a regeneration project with a property rights readjustment and ensuring their voluntary participation;
- creation of a **3D cadastral database** that should be updated with all the necessary information that allows for a fair property valuation;
- estimation of the **market values** of the existing property rights;
- **merging** of the allocated parcels;
- **demolition of the old constructions** and planning of a **new building with increased building factor** by a state decision;
- agreement with **a developer to finance and build new constructions** by implementing energy saving policies in a controlled-profit manner (i.e., by agreeing that a certain number of property units will be given at **affordable prices to a certain target group**);
- **valuation of the new property units**;
- **redistribution of the property rights** for the new units

Readjustment of Property Rights & Affordable Housing Scenario

The new right holders

the old right holders, who will receive new units of a higher value than the one they had prior to the reform, in order to ensure their voluntary participation and their resettlement costs for the period of reconstruction

the developer, who will finance the new construction and work to develop the new units; the developer should receive at least as much profit as a usual project

the target group beneficiaries, who will be low and low-to-middle income households, as defined in the state list

owners should by all means receive more than what they would normally do if they would make a usual agreement with a developer

Application Case Study

one urban block in the municipality of Kessariani, in the eastern part of Athens, Greece

- medium class residential area of the greater metropolitan area of Athens
- multi-storey apartment blocks & private residencies of bad condition
- building factor: 3.0



Input
data

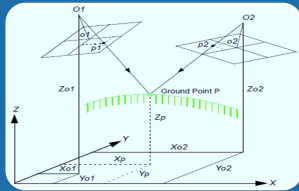


aerial & terrestrial
imagery

ground
control points

cadastral &
other data

3D Modelling of the Existing Situation



Camera exterior orientation calculation of each aerial image through bundle adjustment



Photogrammetric stereo-plotting



Structure from Motion and Dense Image Matching using the terrestrial images



Procedural Modelling

3D Modelling of the Existing Situation - Results

LoD1



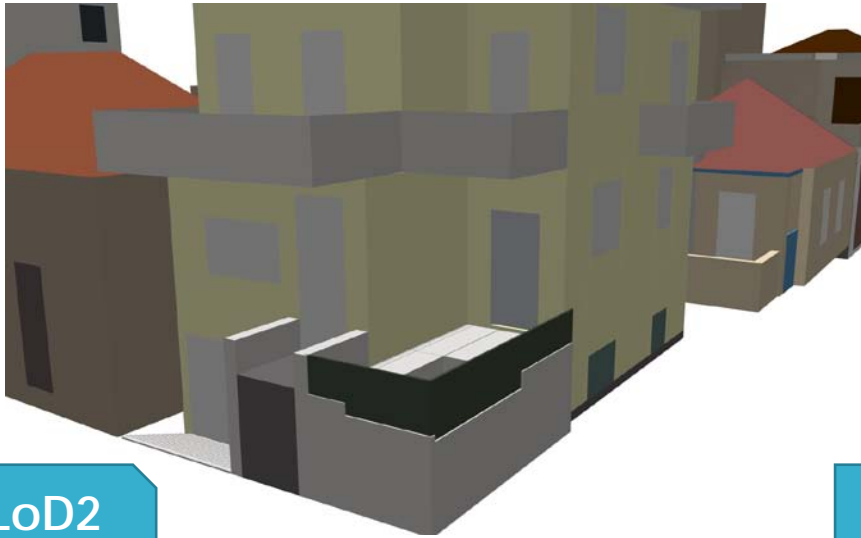
LoD2



LoD3

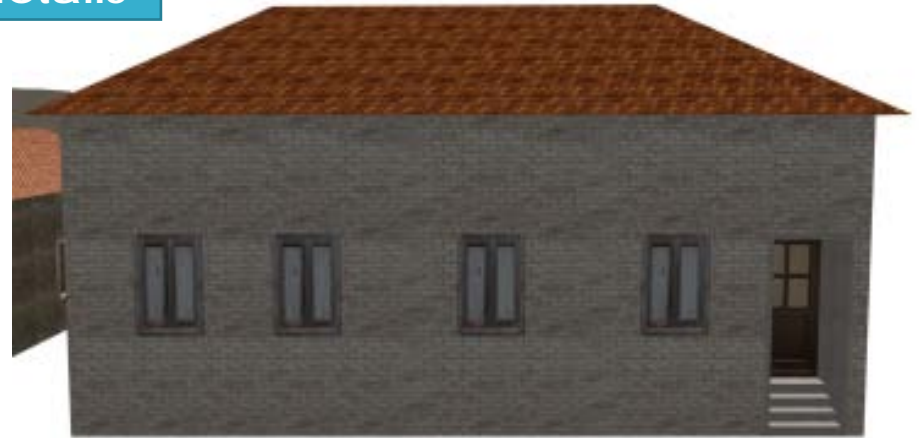
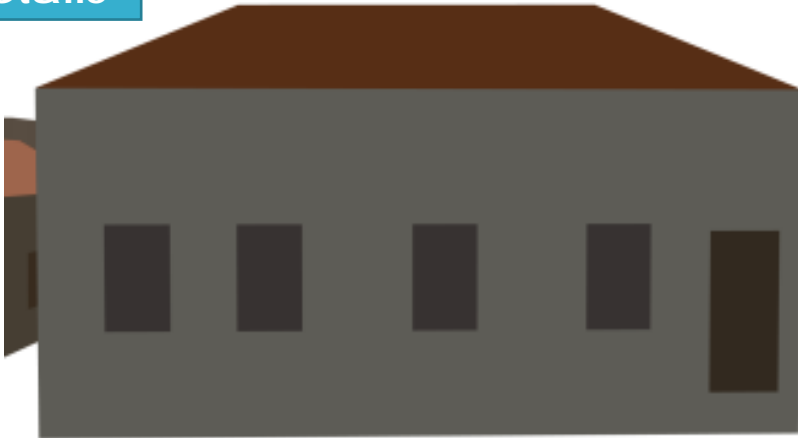


3D Modelling of the Existing Situation - Results



LoD2
details

LoD3
details



Valuation of the Existing Properties

External inspection of the buildings

Thorough market research & consultation with real estate agents, developers and property owners

Valuation of the existing properties using both the Sales Comparison Method and the Residual Method

For the assessment of the market value of the subject properties, comparable evidence of land plots and residential properties and, more specifically, newly built and 20-25 year old apartments in the immediate and broader district were considered.

The resulted range of values has been found to have good correlation to reasonable asking as well as to the actual market values.

Planning for Affordable Housing & Design of the New Building

after the completion of the project the right holders should be offered apartment(s) of a significantly larger market value than the one they owned plus the resettlement costs



The horizontal plan of the new land parcel (red) and the outline of the new building (blue), superimposed on an orthoimage of the study area

voluntary merging of the 5 land parcels for the creation of a unified parcel

The total land area of the selected parcels is 1,077 m², while the total built-up area is 701 m².

35% increase of the building factor

New building factor: 4.07

New allowable built-up area: up to 4,385 m²

Planning for Affordable Housing & Design of the New Building

- **13 apartments** were given to the **old right holders/owners**. Each owner was given a property of **a market value 75% higher than their old property**, in order to ensure that all costs for resettlement are covered and that the owners will voluntarily participate in the project.
- **20 apartments** were given to the **developer**, in order to cover all soft and hard costs, his profit as it would be if he/she had invested in this plot with a building factor of 3.0, and the cost for the construction of those apartments that should be offered at affordable price.
- **16 apartments** were given to **a target group eligible for affordable housing**. These apartments correspond to an area of 48.30-83.25 m², so that they satisfy the housing needs of families comprising 2 to 4 members.

Planning for Affordable Housing & Design of the New Building

The new total built-up area of 4,382 m² is distributed to:

The old owners: 25.1% of the built-up area
27.8% of the value

The developer: 48.1% of the built-up area
56.6% of the value

Affordable residences: 26.8% of the built-up area
15.6% of the value.

Planning for Affordable Housing & Design of the New Building

2010



Future scenario



Conclusions

- A technical tool that supports affordable housing policies, within the framework and the rules of the globalized economy, and the good governance of cities was presented
- A realistic and financially sustainable affordable housing scenario that supports public justice was presented
- The urban regeneration and the affordable housing policies support the **upgrading of the cities** characterized by increased urban sprawl or the informally developed areas and may be applied in countries with increased challenges due to unplanned development

Thank you for your attention!

Questions?

