International Federation of Surveyors
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Technical University of Civil Engineering Bucharest
Faculty of Geodesy

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Aspects about Spatial Information Management to optimize Spatial Planning and Sustainable Development

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2021   The joint Workshop of FIG Commissions 3 and 8 on the theme: "Spatial information management to optimize Spatial planning and Sustainable development"

Purpose of the Presentation

- To highlight **aspects that can be improved** in Spatial Planning and Sustainable Development by using current software possibilities in Romania

- Examples from our recent papers

Topic under the FIG Working Plan 2019-2022

- Correlation with the objectives of FIG Commission 3 from 2019-2022

- *Spatial Information Management, a key discipline for managing spatial and* **temporal dynamics** [1]

- Correlation with the objectives of FIG Commission 8 from 2019-2022 [3]

- Working Group - Joint Commission 3 and 8 - **GIS Tools for Spatial Planning**

Three Main Directions

Spatial Planning – the need to introduce 3D geospatial database to Romanian spatial urban planning using dedicated software

Traffic Analysis – instruments and possibilities

Crowdsourcing Apps – for urban problems

Why Digitalisation in Spatial Planning?

- there are **high-performance software solutions**

- allow **coherent spatial planning**

- allow the collection of the opinions of the interested persons (**crowdsourcing**)

- GIS is important in spatial planning - the possibility to **better understand current needs** for a city, and then design to fulfill those needs, helping planners understand the needs of densely populated areas and enhancing visibility into data, but they also adapt to examining smaller towns and even informal settlements. Now it can be possible to **monitor changes over time**, evaluate the **feasibility of proposed projects** and predict their effects on the environment. [4]

Spatial Data Tools

Data Integration – Cadastral and Urban

Information Access – Online, using Apps and Geoportals

Visualisation - Online, using Apps and Geoportals

Spatial Analysis and Modelling

Spatial Planning – Integrated Workflow

Large Cities – Global Key Problems

■ "Administrations in large cities are often confronted with a multitude of **key problems**, like high urban densities, transport, **traffic congestion**, energy inadequacy, **unplanned development** and lack of basic services, illegal construction both within the city and in the periphery, informal real estate markets, creation of slums, poor natural hazards management in overpopulated areas, crime, water, soil and air pollution leading to environmental degradation, climate change and poor governance arrangements." [4]

Romanian Situation

- the limits of the administrative-territorial units (UAT) available in the geoportal of the National Spatial Data Infrastructure (INIS), **managed by the National Agency for Cadastre and Real Estate Registration** are used. (according to the Methodological Rules for the application of Law no. 350/2001 on spatial planning and urbanism and the elaboration and updating of the urbanism documentation - The Official Gazette no. 199, 17 March 2016)

- Even if architectural or building projects are most often created by using software that allow visualisation in 3D space, in Romania, **the local spatial development plans are still being implemented on the 2D dimensions**.

- This fact led to the following situation: the dimensions related to the height and depth of the objects that means **restrictions in particular areas according with local plans** should be sought in the **textual section** of the planning papers and the **traditional approach to 2D spatial planning is already insufficient**.
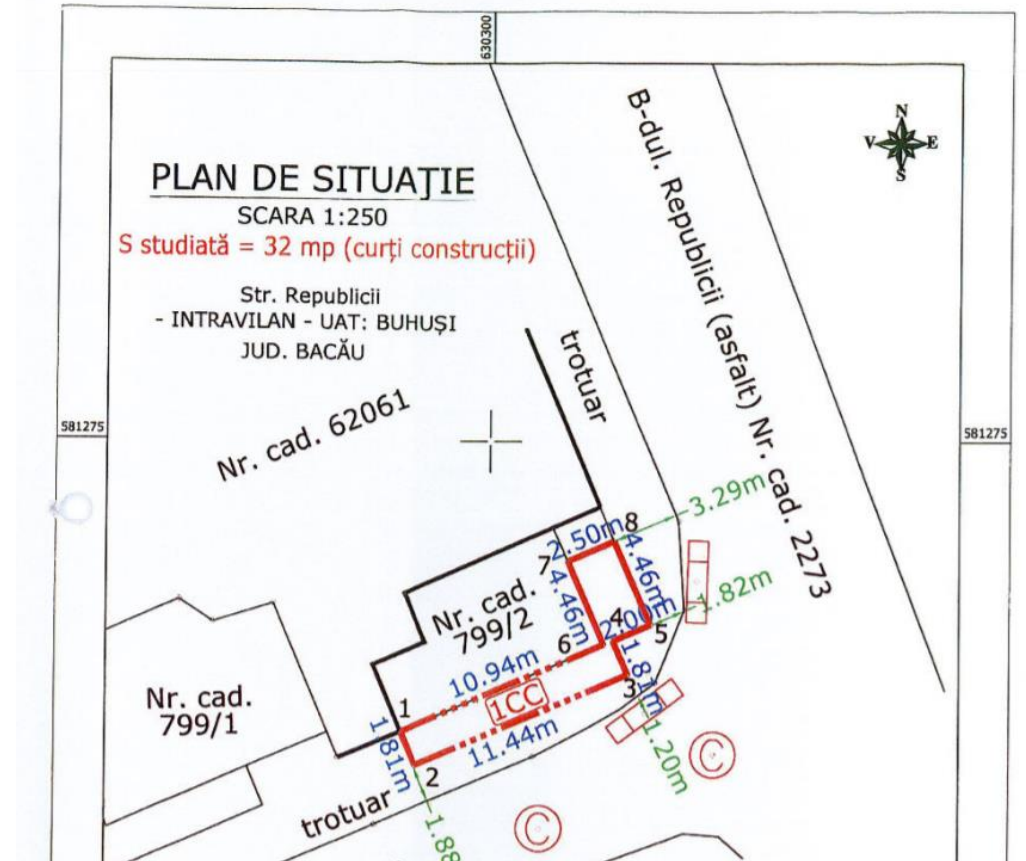
Romanian Situation - Planning

- Detailed Urban Plan (PUD),

- Zoning Urban Plan (PUZ),

- General Urban Plan (PUG)

- https://www.primariabuhusi.ro/wp-content/plugins/download-attachments/includes/download.php?id=cSZVo7mRmGURHGpsyBY818Gh8ROfA1juzaHuhhuZBbo

Examples of Cadastral Data used for PUZ [5]

Example - Cadastral Map using Ortophoto [5]

Example - Situation Map [5]

Actual status:

CADASTRE

CADASTRE
Space extended
Integration of new objects

PLANNING

SPATIAL PLANNING

REAL ESTATE MANAGEMENT

BUILDING DEVELOPMENT

LAND USE PLANNING

(adapted from [8])

Sinergy between Cadastre and Spatial/Land Use Planning

Disadvantages of the Current Working Practice

"The major disadvantage identified in this 2D exclusive mode of work is that, for someone who does not have specialized studies, it may seem difficult to imagine the construction that will be built." [6]

Even if within the obligatory elements of a standard plan there are mentioned all the necessary information (in tables, as indices, etc.), they are not quickly accessible to be integrated into an image as close to reality, but also integrated in the built environment.

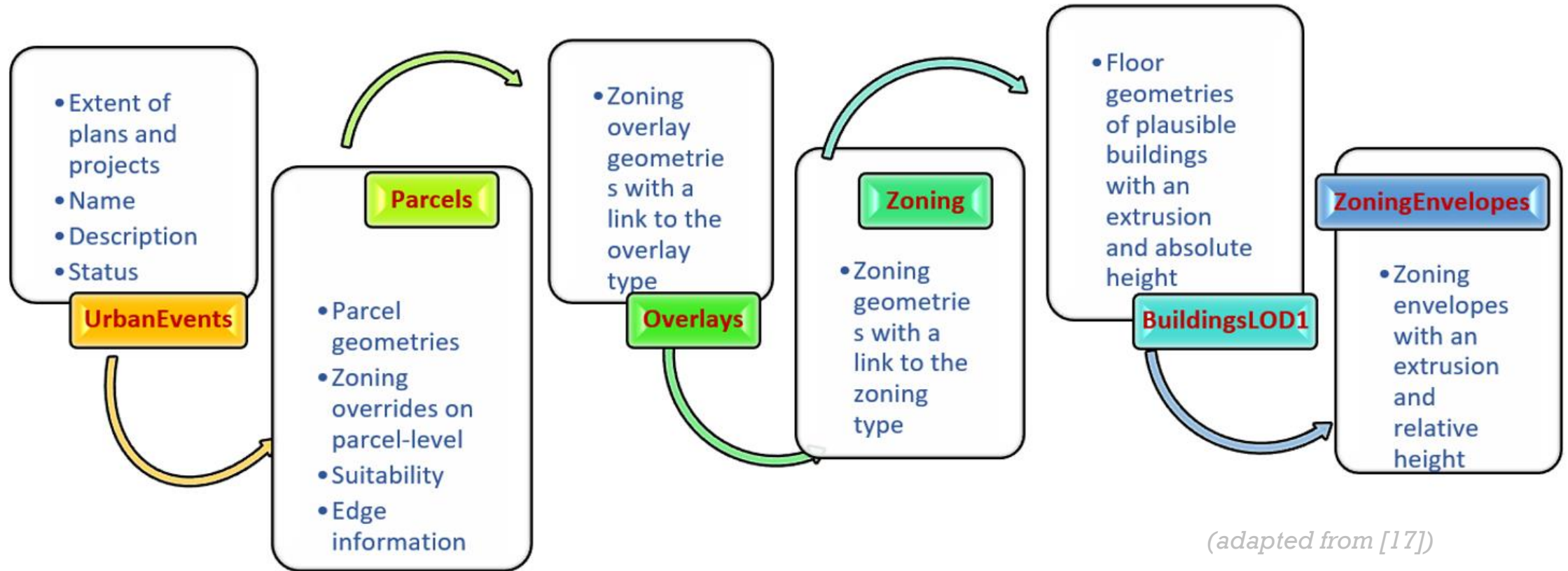## Why we would have the 3D Representation in Spatial Planning?

- To define or create 3D Basemap, Zoning Types, Overlay Types, Building Types, Space Use Types, Project Status Types

- To **improve visualizing of the complex legal situations** and enabling the registration of full information regarding the geometry of buildings.

- The **new created spatial objects** created by planning workflow **should be implemented in the real estate registration and management** (division, merging and division, expropriation) **and construction** (development) processes.

- Mutually, some spatial planning information should also be recorded as 3D objects, which is certainly necessary for areas that are subject to various types of development restrictions.

- The increasing GIS use in spatial planning and design is enabling **a higher quality of quantitative and qualitative data analysis**, improving the evidence base of decision-making process as well as the knowledge base of the decision-making process itself – all factors upon which delivering such an aspirational, but highly complex, policy goal as **Sustainable Development Goal 11** [11]
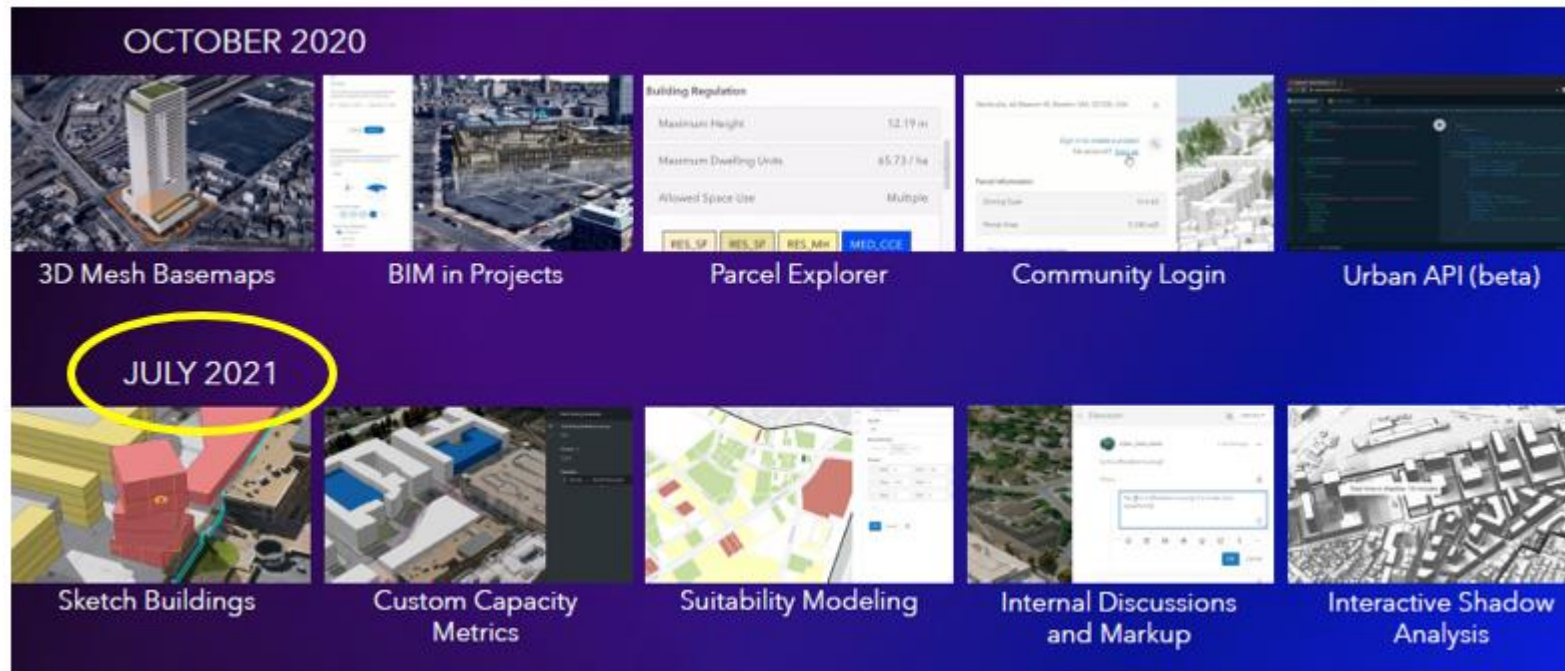
Examples – Public Law Restrictions in Romania

No	Restriction Type	Proposal	Legal Framework (updated, with subsequent amendments and completions)
1	Landscape/ Spatial Planning/ Urban Development	2D / 3D	• Civil Code of July 17, 2009 (Law no. 287/2009) • Methodological Norms of October 12, 2009 for the application of Law no. 50/1991 regarding the authorization of the execution of construction works • Law no. 350 of July 6, 2001 on spatial planning and urbanism • Methodology of April 26, 2000 for the execution of the cadastral works of the Bucharest metro network
2	Mining	2D / 3D	• Civil Code of July 17, 2009 (Law no. 287/2009) • Mining Law no. 85 of March 18, 2003 • Technical Rules of December 20, 2013 for the design and execution of transport pipelines of natural gas • Technical Rules of 10 October 2006 and Updated Technical Requirements specific to the areas of protection and safety zones related to the National Transport System for oil, gasoline, condensate
3	Civil Aviation	2D/ 3D	• Air Code of March 18, 2020 (Law no. 21/2020) • Romanian Civil Aeronautical Regulations of June 9, 2015 on the establishment of zones with civil aeronautical easements
4	Environmental (Air/ Water/ Soil/ Noise/Forests/ Flora/ Fauna/ etc)	2D / 3D	• Civil Code of July 17, 2009 (Law no. 287/2009) • Law no. 121 of July 3, 2019 on the assessment and management of ambient noise • Special Rules of 11 August 2005 on the character and size of sanitary and hydrogeological protection zones • Governmental Emergency Ordinance no. 195 of December 22, 2005 on environmental protection • Forestry Code of March 19, 2008 (Law no. 46/2008) • Water Law no. 107 of September 25, 1996 • Order no. 2387 of September 29, 2011 amending the Order of the Minister of Environment and sustainable development no. 1,964/ 2007 regarding the establishment of the protected natural area regime of sites of Community importance, as an integral part of the European 2000 Nature Network in Romania • Governmental Emergency Ordinance no. 57 of June 20, 2007 on the regime of protected natural areas, conservation of natural habitats, wild flora and fauna
5	Cultural Heritage/ Arch. & Hist. Mon.	2D / 3D	• Law no. 422 of July 18, 2001 on the protection of historical monuments • Order no. 2314 of July 8, 2004 on the approval of the updated List of Historical Monuments and the List of Missing Historical Monuments
6	Utilities/ Infrastructures	2D / 3D	• Law no. 255 of 14 December 2010 on expropriation for reasons of public utility, necessary to achieve objectives of national, county and local interest • Technical Rules of March 9, 2007 on the delimitation of protection and safety zones relate • Law no. 120 of June 20, 2019 regarding some measures necessary for the accomplishment of the works and implementation of projects of national importance regarding the electric transmission network • Methodology of November 17, 1997 on the execution of energy cadastre works • Law no. 154 of September 28, 2012 on the regime of electronic communication network infrastructure

(adapted from [15])

The Advantages of using a Dedicated Software in Urban Planning

- **GIS make possible to monitor fluctuations over time**, evaluate the feasibility of proposed projects and predict their effects on the environment. [10]

- ArcGIS Urban
  - a part of Esri Geospatial Cloud,
  - a web-based 3D modelling tool
  - designed to improve urban planning and decision-making
  - three components:
    - a public-facing Urban Overview web app for standard browsers and/or mobile devices;
    - a back-office Urban Design web app;
    - Esri CityEngine for desktop workstations. [7]

- Extent of plans and projects
- Name
- Description
- Status

UrbanEvents

Parcels

- Parcel geometries
- Zoning overrides on parcel-level
- Suitability
- Edge information

- Zoning overlay geometries with a link to the overlay type

Overlays

Zoning

- Zoning geometries with a link to the zoning type

- Floor geometries of plausible buildings with an extrusion and absolute height

BuildingsLOD1

ZoningEnvelopes

- Zoning envelopes with an extrusion and relative height

(adapted from [17])

(adapted from [9])

ArcGIS Urban New Features

ArcGIS Urban Database Structure

(adapted from [6])

Tables

Branches
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

Config
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

Indicators
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

ZoningTypes
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

BuildingTypes
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

SpaceUseTypes
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

OverlayTypes
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

StatusTypes
Open In ⌄ | Export To ⌄ | Enable Attachments | Service URL | Metadata

Description

ArcGIS Urban Design Database

Layers

UrbanEvents
Open In ⌄ | Export To ⌄ | Time Settings | Enable Attachments | Service URL | Metadata

Zoning
Open In ⌄ | Export To ⌄ | Time Settings | Enable Attachments | Service URL | Metadata

Overlays
Open In ⌄ | Export To ⌄ | Time Settings | Enable Attachments | Service URL | Metadata

BuildingsLOD1
Open In ⌄ | Export To ⌄ | Time Settings | Enable Attachments | Service URL | Metadata

ZoningEnvelopes
Open In ⌄ | Export To ⌄ | Time Settings | Enable Attachments | Service URL | Metadata

Parcels
Open In ⌄ | Export To ⌄ | Time Settings | Enable Attachments | Service URL | Metadata

Example – Defining Zoning Constraints

Zoning Types ⓘ

Color	Label ⌄	Description
■	CA1	central sub-area with the function of business cen... accents over 50 meters
■	CP4	sub-area of the central commercial and business...
■	L1a	small and collective dwellings max P + 2 levels
■	L3a	average collective dwellings P + 3 - P + 4 levels
■	M2	mixed sub-area maxi heights of GF + 14 levels w... high accents above 45 meters;
■	OS	Open Space

Zoning Type: M2 - mixed sub-area with buildings having continuous or discontinuous construction and maximum heights of (existing)

Label
M2

Join ID
M2

Description
mixed sub-area with buildings having continuous or discontinuous construction ar
Remaining characters: 0

Color
■ #E08038

Maximum Coverage
0.7

Maximum FAR
3

Description
central sub-area with the function of business center accents o

Color
■ #D4617B

Maximum Coverage
0.75

Maximum FAR
3

Maximum Height
300 ft

Maximum Number Floors
25

Maximum Substructure Depth
60 ft

Maximum Dwelling Units

(adapted from [6])

Example – Constraints for Designing Building Types
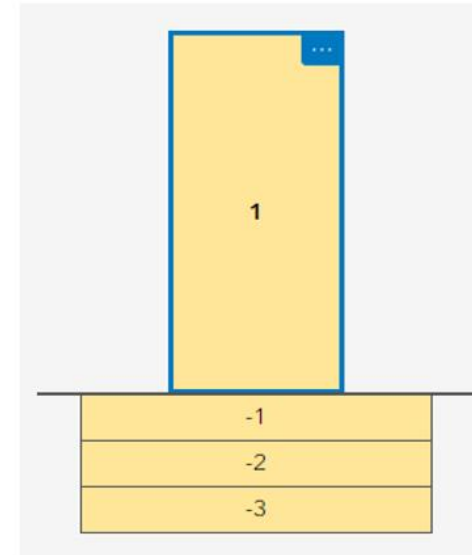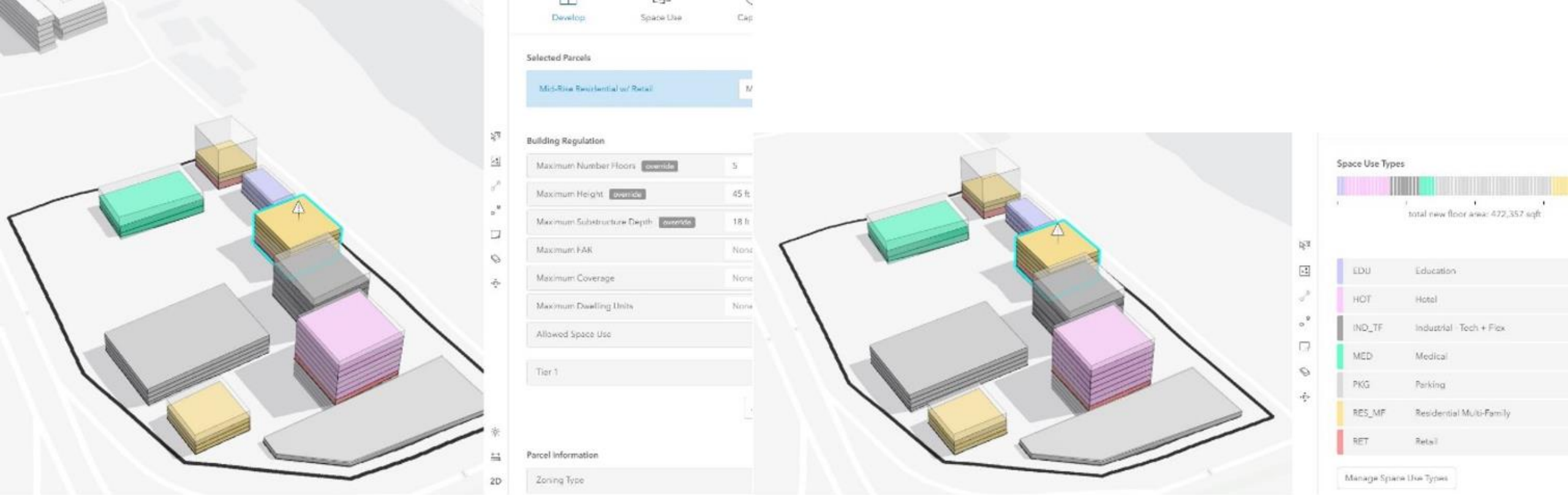
(adapted from [6])

(adapted from [6])

Example - Building Regulation and Space Use Types with Highlighted Error

Example – Automatic Error Identification

(adapted from [6])

▪ The errors due to non-compliance with the restrictions in the area are highlighted in real time, so they can be resolved quickly. At the same time, if the information is shared online, the decision makers and the community have the opportunity to see even those areas where the legal criteria were not respected.

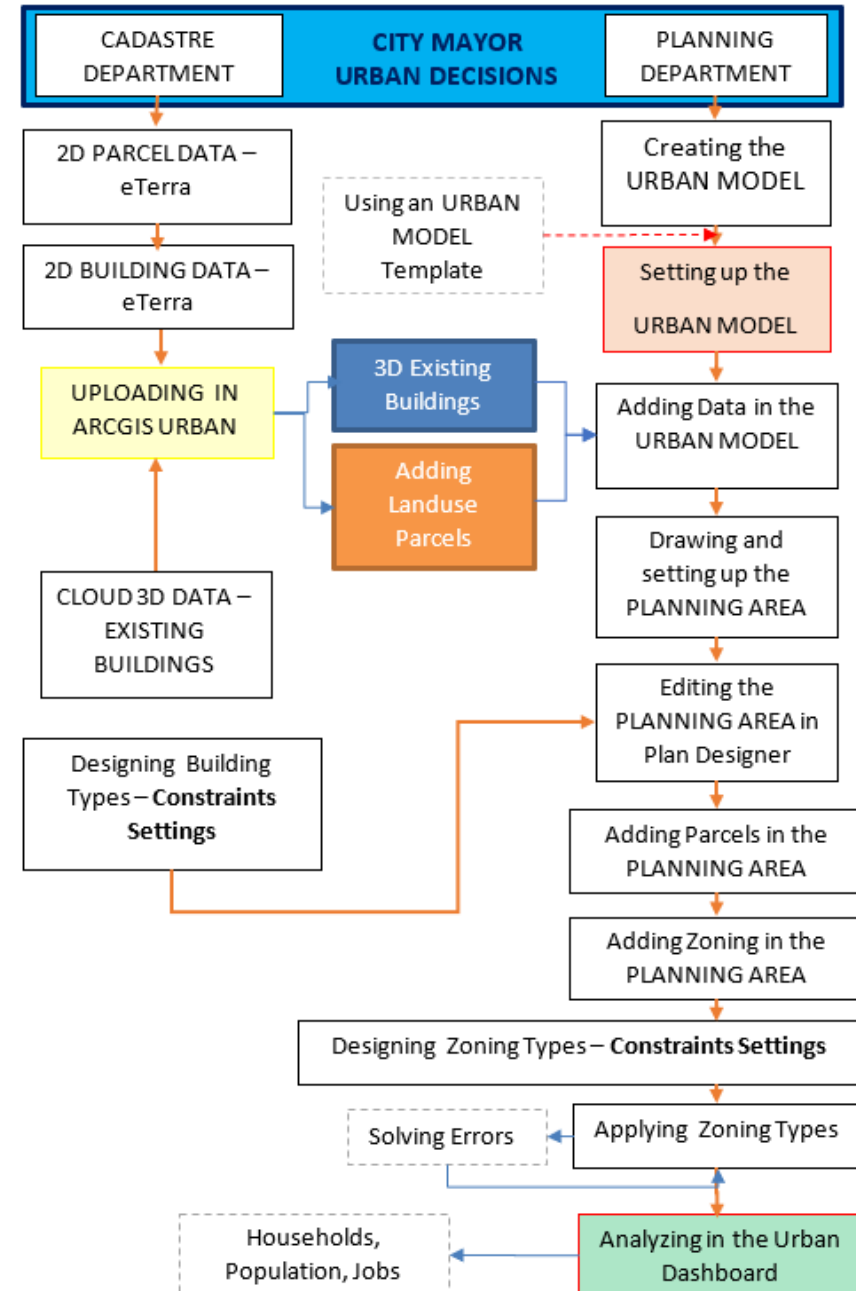# Urban Design Tools: Population, Households, Jobs
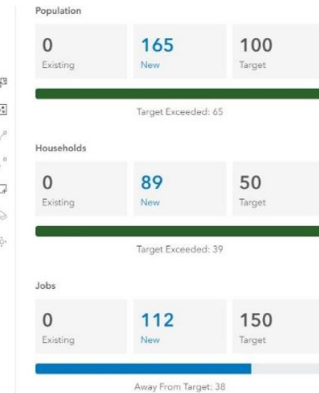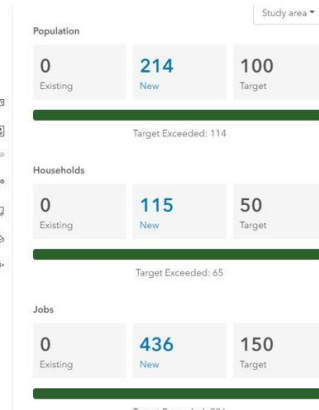
(adapted from [6])

- **The Urban Design tools** manages spatial information into a **focused set of scenario planning capabilities**. It can be used authoritative data on existing conditions to provide the basis for future scenario development and, it there are available, reporting on **key performance indicators**, such as the number of **new households and jobs**.

Example - Visible Envelopes and Underground Space)

Constraint – defined envelope
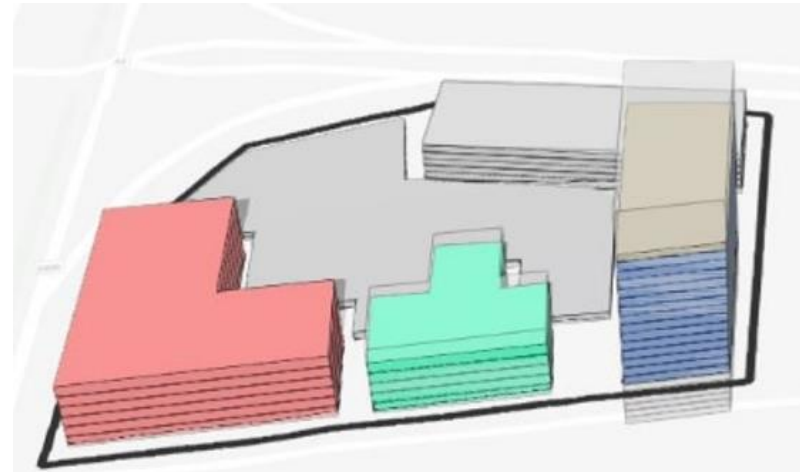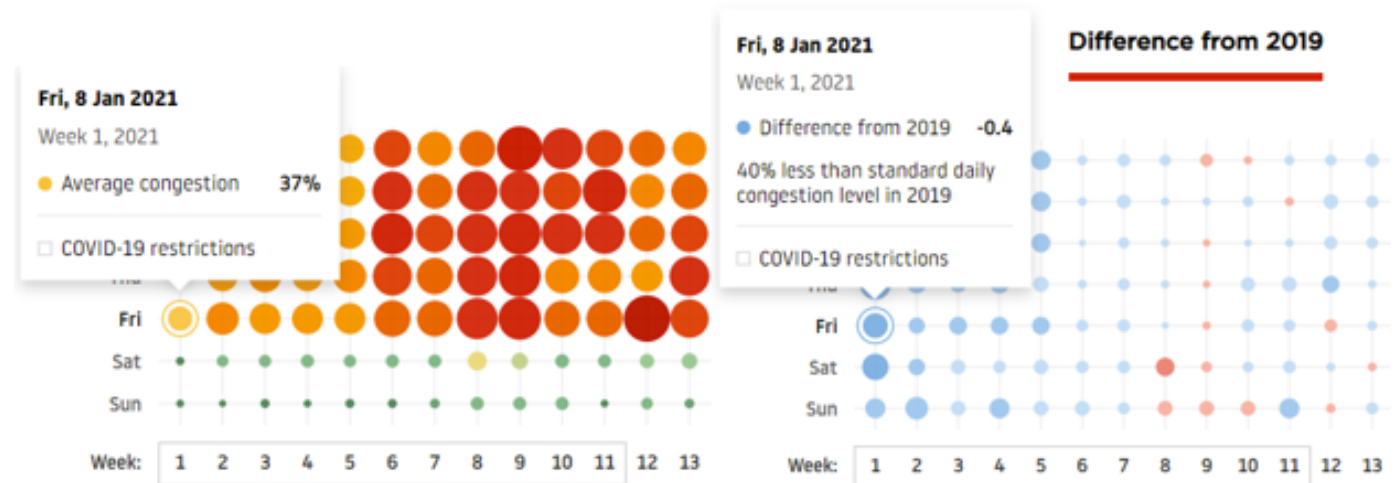
(adapted from [6])

A Possible Model to be Implemented in the City Hall Workflow (ArcGIS Urban)

CADASTRE DEPARTMENT	CITY MAYOR URBAN DECISIONS	PLANNING DEPARTMENT

2D PARCEL DATA – eTerra

2D BUILDING DATA – eTerra

Using an URBAN MODEL Template

UPLOADING IN ARCGIS URBAN

3D Existing Buildings

Adding Landuse Parcels

CLOUD 3D DATA – EXISTING BUILDINGS

Designing Building Types – **Constraints Settings**

Creating the URBAN MODEL

Setting up the URBAN MODEL

Adding Data in the URBAN MODEL

Drawing and setting up the PLANNING AREA

Editing the PLANNING AREA in Plan Designer

Adding Parcels in the PLANNING AREA

Adding Zoning in the PLANNING AREA

Designing Zoning Types – **Constraints Settings**

Solving Errors

Applying Zoning Types

Households, Population, Jobs

Analyzing in the Urban Dashboard

(according to[6])

Traffic Analyzes

- Spatial planning and strategies created need to be based on different criteria, taking into account various indicators. **One of these indicators should be those related to traffic analysis, in order to prioritize infrastructure works.** [13]

- the possibility to **perform geospatial analyzes using traffic services**

- The TomTom Traffic Index has been providing detailed insights on traffic congestion levels in over 400 cities around the world for the past 10 years, covering 416 cities across 57 countries on 6 continents and providing free access to city-by-city information. [13]

Example – TomTom Analysis - Traffic Index Differences in Bucharest Traffic

(adapted from [12])

- Average Congestion Levels in 2019 vs. 2021
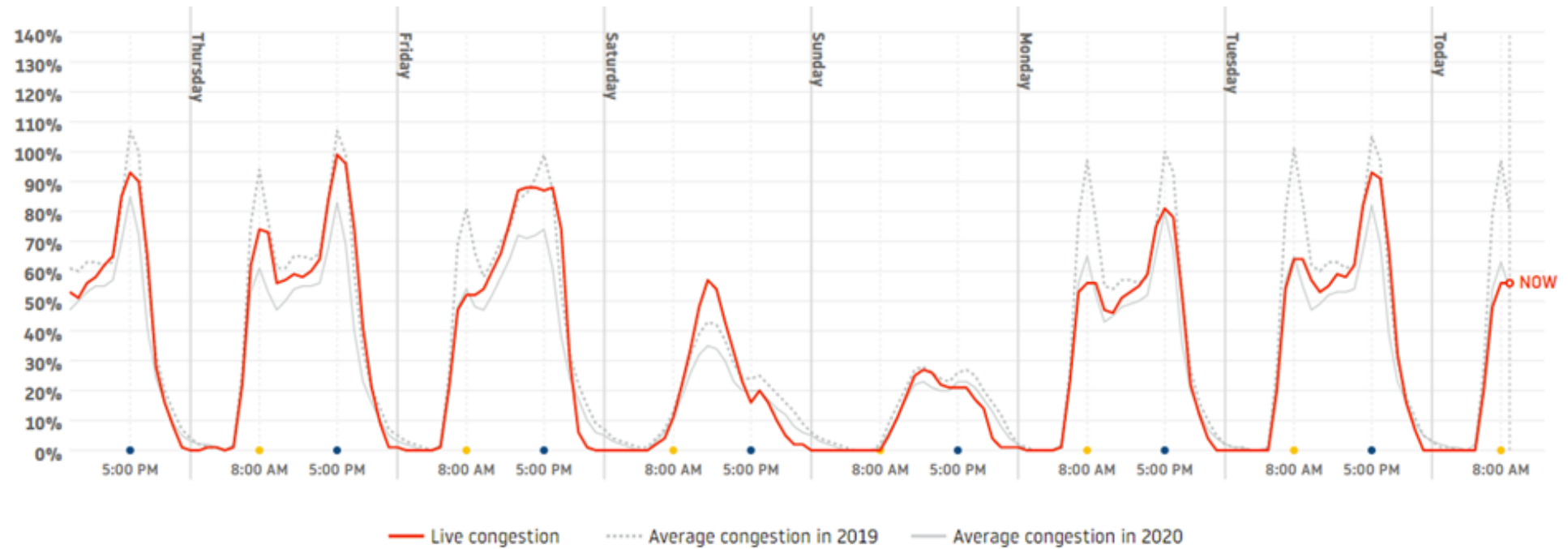
(adapted from [12])

Example - Coronavirus Traffic Peak Analysis Based on TomTom Services (Live Situation vs Average Congestion in 2019 and 2020)

Rush Hour in Bucharest

|	Sun	Mon	Tue	Wed	Thu	Fri	Sat
12:00 AM	5%	2%	2%	3%	3%	3%	5%
	3%	0%	1%	2%	2%	2%	3%
02:00 AM	2%	0%	1%	1%	2%	1%	2%
	1%	0%	0%	1%	1%	0%	1%
04:00 AM	0%	0%	0%	0%	0%	0%	0%
	0%	2%	1%	2%	2%	2%	0%
06:00 AM	0%	23%	23%	22%	22%	21%	3%
	0%	56%	57%	54%	53%	48%	6%
08:00 AM	1%	65%	65%	63%	61%	54%	11%
	6%	52%	55%	54%	53%	48%	18%
10:00 AM	11%	43%	47%	47%	47%	47%	26%
	17%	45%	49%	50%	50%	52%	32%
12:00 PM	22%	48%	52%	53%	54%	58%	35%
	23%	49%	53%	55%	55%	64%	34%
02:00 PM	21%	50%	53%	55%	55%	72%	30%
	20%	52%	54%	57%	56%	71%	23%
04:00 PM	20%	66%	67%	70%	68%	72%	20%
	23%	80%	82%	85%	83%	74%	20%
06:00 PM	23%	67%	69%	72%	69%	61%	20%
	21%	36%	39%	41%	40%	38%	17%
08:00 PM	17%	20%	23%	24%	23%	24%	14%
	13%	13%	16%	16%	16%	17%	12%
10:00 PM	8%	7%	9%	9%	10%	10%	8%
	4%	4%	5%	5%	5%	6%	6%

(according to [13])

Using AGOL Traffic Data

- Esri Living Atlas is a **collection of maps, apps and data, available for use by the community**, being made available by Esri, with content provided by Esri and partners, organizations, and users from around the World. The data can be explored and combined with the users own data and content to create maps, applications and to perform analysis. [14]

- Esri Living Atlas Traffic Service presents **historical and near real-time traffic information for different regions in the world**, in which the **data is updated every 5 minutes, being a global service**. [14]

- Here **provides historical, live, and predictive traffic feeds**, based on billions of GPS and cell phone probe records per month, and uses sensor and toll-tag data to augment the probe data collected using an advanced algorithm to process the data at accurate speeds. [14]

- The **IncidentType field** in the traffic incident layers can have the following values: Accident, Congestion, Construction, Disabled Vehicle, Lane_Restriction, Mass Transit, Miscellaneous, Other News, Planned Event, Road Hazard, Road_Closure, Weather.

- The **Severity field** in the traffic incident layers can have the following values: critical, major, minor, low impact, where critical indicates a road closure and major indicates a blockage of multiple lanes.

Incidents

TomTom Approach

- 🔴 > 50%
- 🟠 25% - 50%
- 🟡 15% - 25%
- 🟢 < 15%
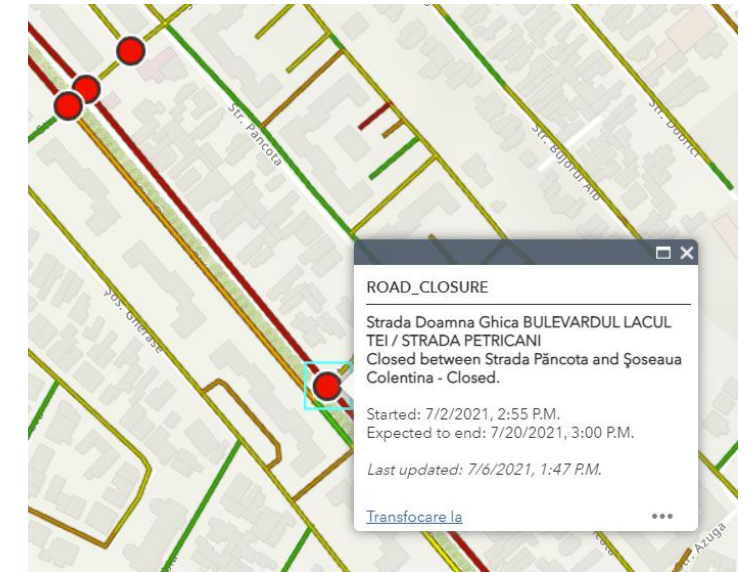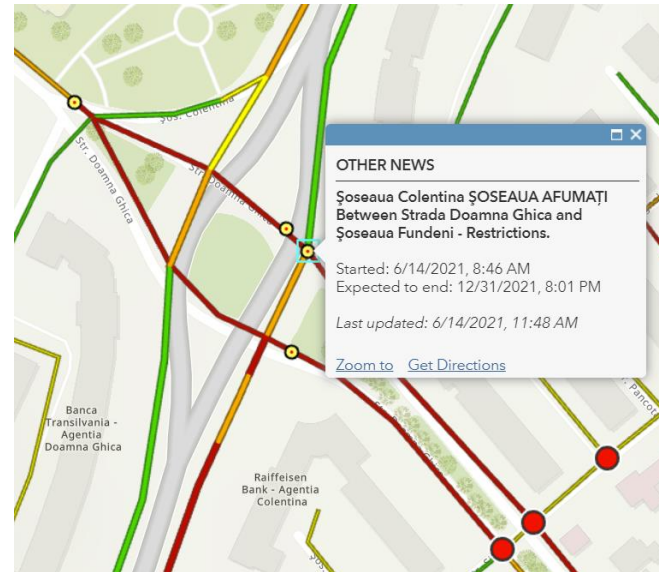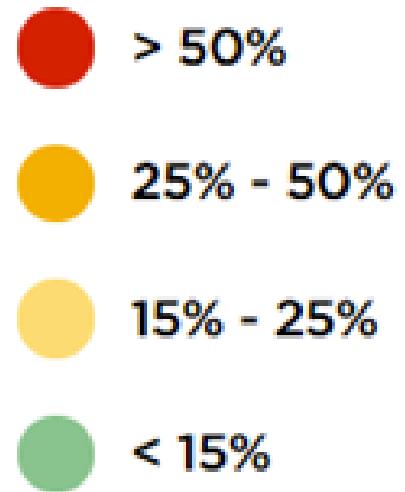
congestion
levels in cities

Europe Traffic Incidents

Traffic Incidents Detailed

🔴 critical

🔴 major

🔴 minor

🟡 low impact

Europe Traffic

Traffic

━ Stop and Go

━ Slow

━ Moderate

━ Free Flow

AGOL Approach

red (stop and go): 0 - 45%,

orange (slow); 45 - 65%,

yellow (moderate): 65 - 85%,

green (fast): 85 - 100% of free flow speeds

- **WEBAPP to highlight Changes based on Imagery (WEBAPP LINK)**

Example - the past vs the present situation of traffic near the A3 highway in Bucharest
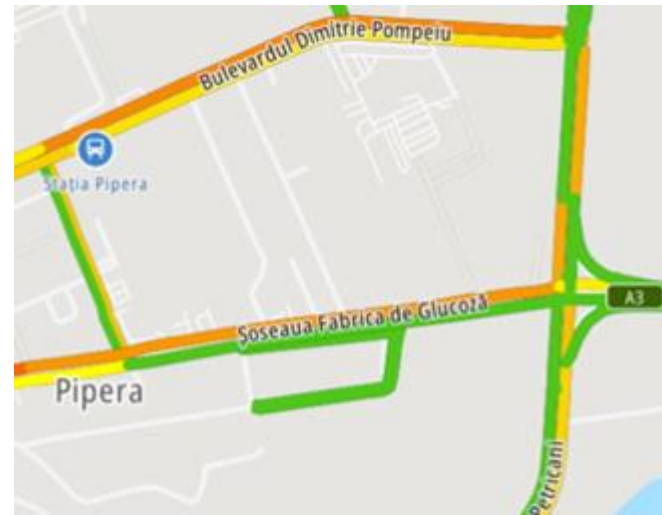
Traffic in Real Time, Wednesday, 9 a.m., TomTom (left) and AGOL (right)

Example 1

- Bucharest, near the Technical University of Civil Engineering, where the traffic is affected by the A3 highway and the currently blocked works from the Doamna Ghica passage and where we highlighted the usefulness of traffic services, live and historical, to analyze the distance that can be traveled by car in 5 minutes, on different days and at different times.
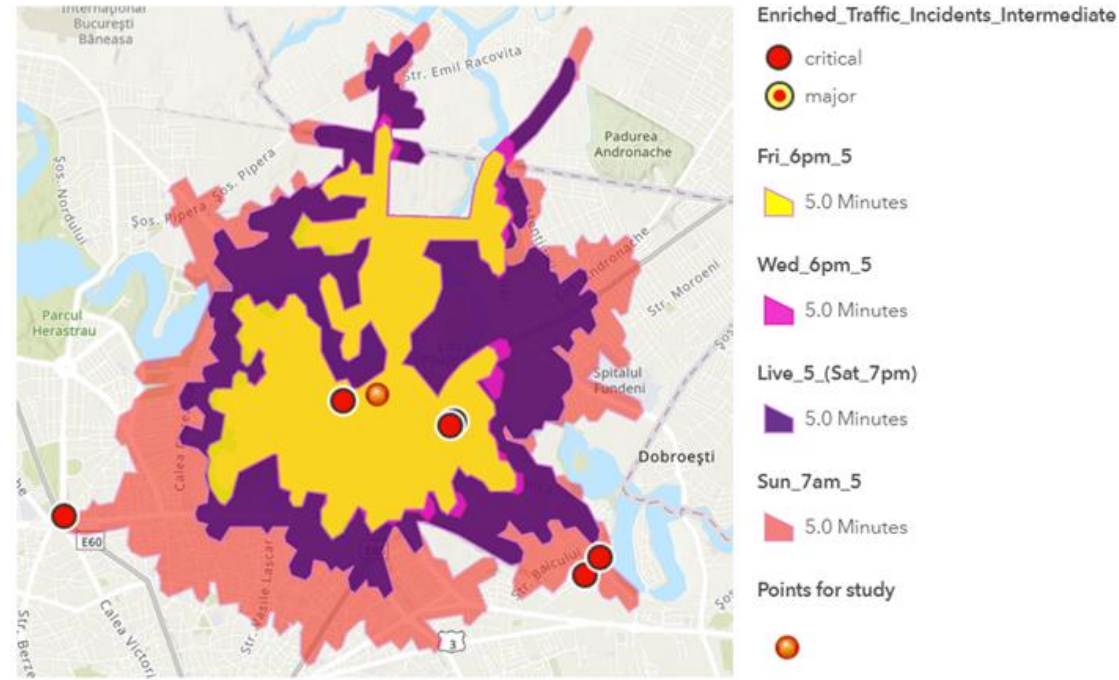
(WEBMAP LINK)

Drive Time Areas Analysis for 5 min – from Technical University of Civil Engineering Bucharest

Example 2
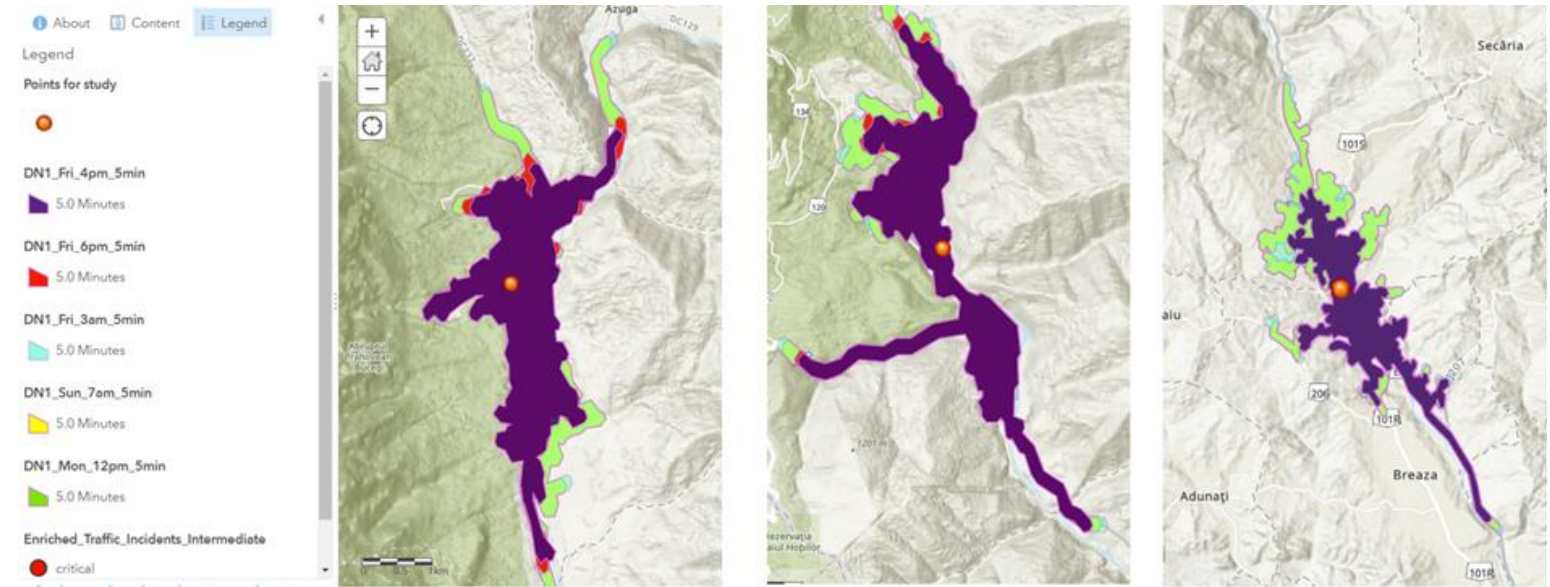
(adapted from [12])

- 5 min travel time from Comarnic, Sinaia and Busteni to Predeal – Prahova Valley – DN1 (WEBMAP LINK)

Collecting Urban Problems - FitForPurpose Methods

- Crowdsourcing - problem-solving strategy for city project planning, considering the overall municipal goal should be to serve the general public

- Future directions of the application of crowdsourcing in urban planning

- "Boston harnessed the power of crowdsourcing for many projects over the last several years. One of if its first efforts was a simple online form to gather community feedback." [19]
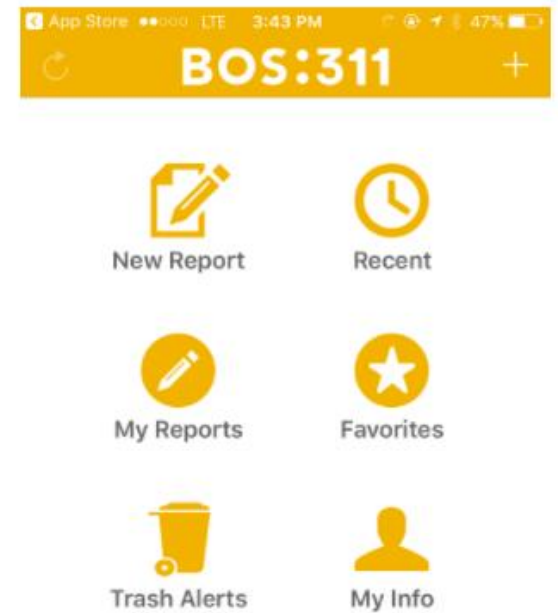
Boston's 311 app
BOS:311

Needs of Urban Planning	Advantages of Crowdsourcing	Developing Trends
Information collection: city-related, multi-source data	Full use of data obtained from mobile devices	More platforms using mobile crowdsourcing
Information analysis: complex information processing	Powerful data processing capabilities	More platforms using big data approaches (e.g., machine learning)
External cooperation - public involvement	Input crowd wisdom from multi-source data	More freely accessed crowdsourcing tasks with a low threshold, issued by the government
Internal cooperation between government departments	A comprehensive process of multi-source information	More platforms conducting cross-dataset analysis
Openness: transparency in urban planning management	Information disclosure based on open platforms	Crowdsourcing platforms will provide more free access to knowledge and data
Fairness: multi-dimensional considerations, the pursuit of equality	Parameterized input, multiple sources of information, and overall analysis	Multi-source data and opinions with more scientific empowerment
Adaptability: adjust the planning direction and methods according to recent circumstances	Collect dynamic data and design a simulation model	More open-source models based on extensive simulations
Diversity: different areas require different kinds of treatment	Relevant platform design	More specialized platforms dealing with traffic, social, environmental, and other issues

(adapted from [18])

Example 1

- data collection that **highlights changes of the buildings - authorized or not**.

- could be implemented for example by mayors in order to identify:

  - **illegal buildings;**

  - **changes or extensions of illegal buildings;**

  - **heritage buildings;**

  - **greenery that was built illegally;**

  - **state of the heritage buildings based on images and location provided by interested citizens.**

Example 1

(adapted from [16])

Example 2

- Collecting **urban problems**: garbage, pit on the road, pit on the sidewalk, graffiti, animal carcasses, intervention works on utility networks, vegetation problems

- **Crowdsourcing can be seen as a complementary approach to facilitate the data collection process of other RRRs** [16]

- URBGREEN APP

- to collect **data about changes in the urban green environment**: cut trees in parks, green areas built, dried or untrimmed trees etc.

- could be more advantageous to enforce these reports - including geolocation and image - to be collected by interested citizens, by comparison with cases where it would be collected bythe City Hall staff.
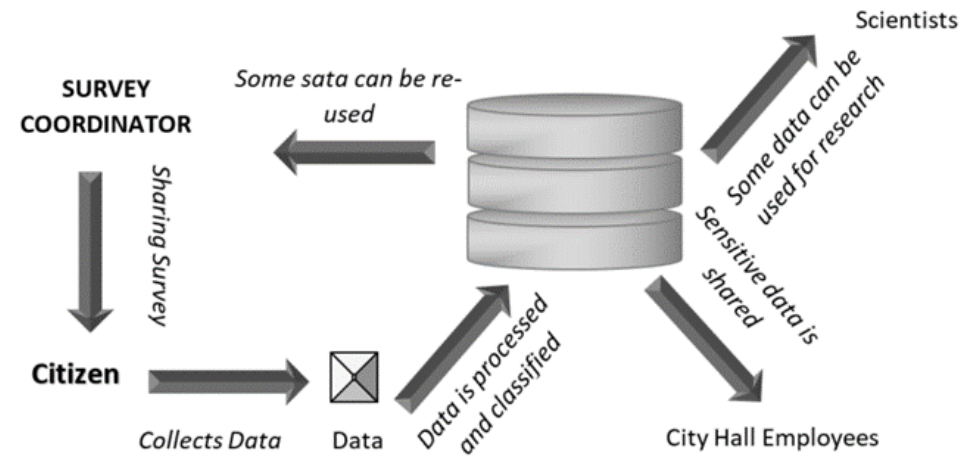
Example 3

(adapted from [20])

- **The Specific Fields Species of Trees in URBGREEN**

Example 3

select_one LandParcel	LandParcelData	It is a Land Parcel?			
begin group	LandParcelInfo	Data about a Land Parcel			${LandParcelData}='yes'
select_one GreenSpaceUse	GreenSpaceUse	GreenSpaceUse	multiline	1	
select_one GreenSpaceBuilt	GreenSpaceBuilt	GreenSpaceBuilt	likert	1	
image	PhotoGreenSpace	PhotoGreenSpace			${GreenSpaceBuilt}='yes'
select_one LegalStatus	LegalStatus	LegalStatus	multiline	1	
end group					
select_one Tree	Tree	It is a Tree?			
begin group	TreeInfo	Data about a Tree			${Tree}='yes'
integer	Height	Height			
text	Address	Address			
image	Photo	Photo			
select_one RiskLevel	Risk	Risk	multiline	1	
select_one Viable	ViableState	ViableState	multiline	1	
select_one Type_of_Tree	TreeType	TreeType	multiline	1	
select_one TreeSpecies	Species	Species	minimal	1	
integer	Diameter	Diameter			
select_one MaintenanceStatus	MaintenanceStatus	MaintenanceStatus	multiline	1	
select_one Trim	Trimmed	Trimmed	multiline	1	
end group					
text	Operator	Operator			
dateTime	Data	Data		now()	
note	Notifications	Notifications			
geopoint	Location	Location			

	list_name	name	label	ima
1				
240	TreeSpecies	198	Cedrus_deodora	
241	TreeSpecies	199	Torreya_nucifera	
242	TreeSpecies	200	Ceratonia_siliqua	
243	TreeSpecies	201	Magnolia_acuminata	
244	TreeSpecies	202	Quercus_ilex	
245	TreeSpecies	203	Prunus_fruticosa_Globosa	
246	TreeSpecies	204	Celtis_occidentalis	
247	TreeSpecies	205	Rhamnus_frangula	
248	TreeSpecies	206	Fraxinus_quadrangulata	
249	TreeSpecies	207	Populus_angustifolia	
250	TreeSpecies	208	Robinia_hispida	
251	TreeSpecies	209	Lonicera_japonica	
252	TreeSpecies	210	Ulmus_carpinifolia	
253	TreeSpecies	211	Quercus_imbricaria	
254	TreeSpecies	212	Ulmus_procera	
255	TreeSpecies	213	Ulmus_laevis	
256	TreeSpecies	214	Celtis_glabrata	
257	TreeSpecies	215	Ulmus_pumila	
258	TreeSpecies	216	Gymnocladus_dioica	
259	TreeSpecies	217	Alnus_incana	
260	TreeSpecies	218	Salix_petandra	
261	TreeSpecies	219	Juniperus_squamata	
262	TreeSpecies	220	Prunus_triloba	
263	TreeSpecies	221	Acer_buergerianum	
264	TreeSpecies	222	Magnolia_soulangeana	
265	TreeSpecies	223	Weigela_hybrida	
266	TreeSpecies	224	Vaccinium_corymbosum	
267	TreeSpecies	225	Fraxinus_americana	
268	TreeSpecies	226	Fraxinus_ornus	
269	TreeSpecies	227	Lonicera_pileata	
270	TreeSpecies	228	Camellia_japonica	
271				
272	LandParcel	1	Yes	

- **URBGREEN Data**

Example 3

- **Collected Data Viewed in Online Environment**

Example 3
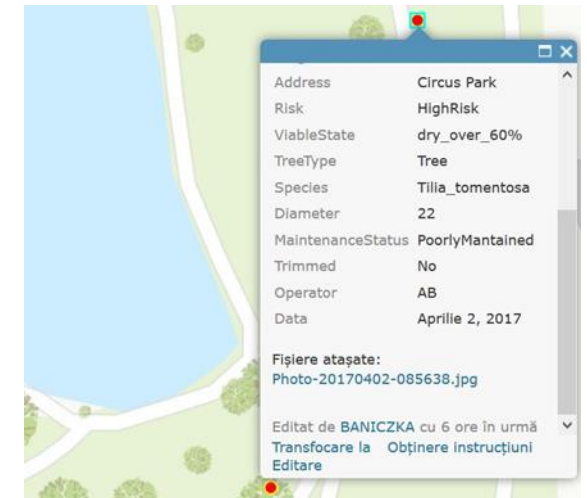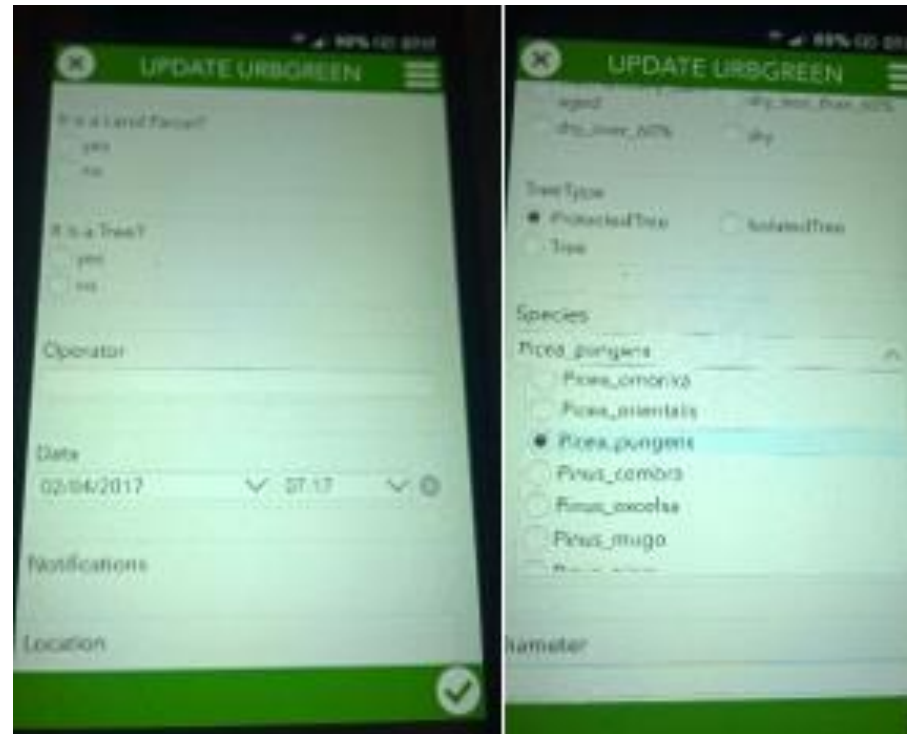
- Dried Trees Transformed into Art in Circus' Park, Bucharest – collected by URBGREEN

Example 3

Long-term benefits are empowering the citizens as well as the town hall departments and developing green spaces through efforts for a better quality of the environment.

Final Ideas

- sometimes there is a great **reluctance** towards existing software solutions, **being preferred the "traditional" way of working** in the public administration

- there is a **disregard for the importance of the work of surveying engineers within the workflow for spatial planning**

- the **proposed workflow** has the following advantages: the development projects can be visualized, tracked and reviewed throughout the entire lifecicle, the creation and sharing of zoning are made directly in web browser (3D and 2D) and the performance indcators can be disseminated to the interested parties.

- 3D urban planning can be designed, developed, verified and readily shared online through ArcGIS Urban, but in the future there are needed more effort to validate the geometrical 3D objects for accurate measurement of building height and setbacks.

- the **need for surveying and cadastral disciplines** needed to prepare in urban planning and architecture disciplines for training in urban planning and architecture - in order to **correctly understand the representations on specialized maps/scenes**

Conclusions

- ArcGIS Urban is used to reporting on **key performance indicators**, such as the number of new households and jobs

- ArcGIS Urban used for local administration planning activity - **transparent decision making**, 3D representation of normative regulations, enhanced planning workflow could be improved

- the combined analysis of space and time in identifying traffic situation enables authorities to **capture the situation accurately and timely**

Conclusions

- spatial planning needs to be based on traffic services:

  - example: Colentina area - Doamna Ghica Passage - there is an urgent need to resume and complete the works, because, as can be seen from the analysis results, traffic suffers major disruptions and citizens' lives are much more difficult due to stopping works.

  - there has been the problem of building a highway to streamline traffic in Prahova Valley area, and this type of rapid analysis, coupled with more additional population data, could be an additional means to substantiate the justification of the investment.

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Thank you for your kind attention!

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