



Experimenting with Data and IoT in the urban space: the case of Trikala

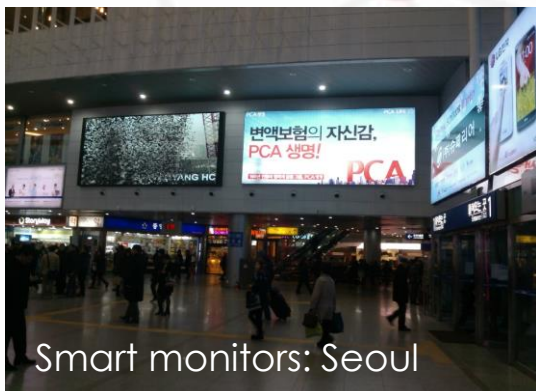
Leonidas Anthopoulos

Associate Professor TEI of Thessaly, Greece

Mayor's Special Advisor, the city of Trikala, Greece

Head of the Greek Smart City Standardization Group

What do SC do with IoT?



Smart monitors: Seoul



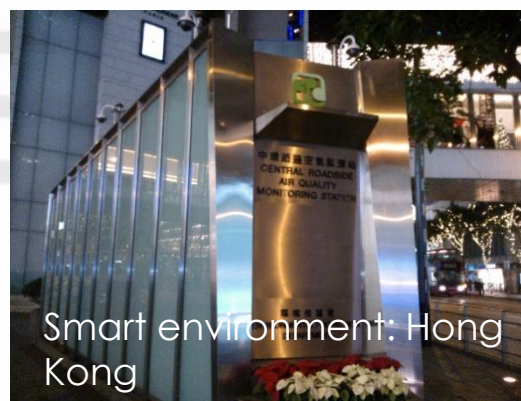
Smart buildings: Songdo



Smart signs: Geneva



Smart bins: London



Smart environment: Hong Kong



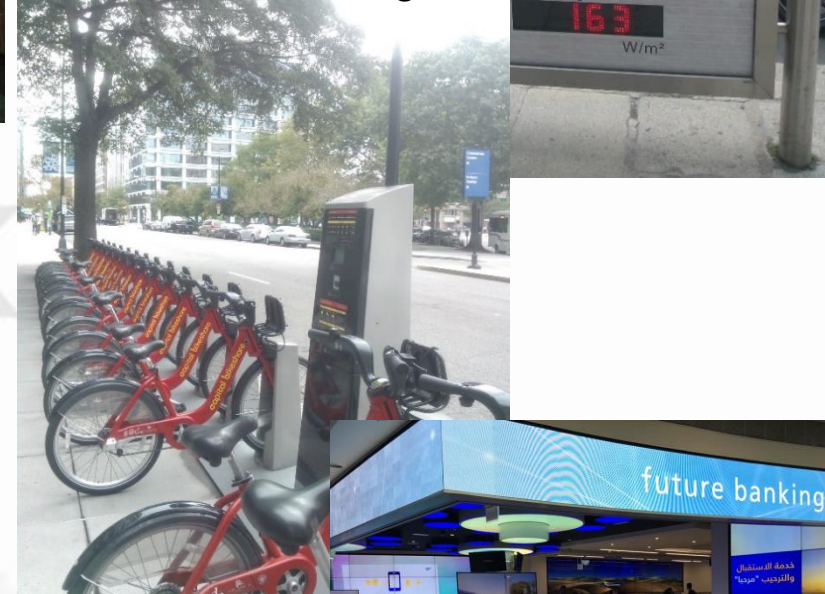
QR codes: Hong Kong



Energy monitoring: Vienna



Smart bikes: Washington



Future banking: Dubai

An aerial photograph of a town, likely Trikala, Greece. The town is built on a hillside with a river flowing through it. A prominent feature is a large, circular stone structure, possibly a castle or a stadium, situated on a hill. The town is densely packed with buildings, many with red-tiled roofs. The background shows a mix of urban and green spaces.

5.000

**Years of history.
Birthplace of Asklepios
(Aesculapius), the first
doctor of the universe!**

81.355

**Inhabitants.
The Municipality consists of
the city of Trikala surrounded
by 34 villages
Area: 608 km²**



6.000

**famous Greek songs were
composed
and performed by:
Tsitsanis, Virvos
Kaldaras, Samoladas,
Mitropanos, Kolokotronis**

No.1

**Prefecture in bottling Tsipouro
(famous Greek drink)
and feta cheese
Also famous the Trikalian
sausage!**

Experimenting in Trikala

Strengths

- Agriculture
- Strong higher education system
- A long “smart” story
- Branding (Elves Mill)
- Coherent community

Weaknesses

- Low local GDP
- High levels of unemployment
- Only 2 university departments
- National «Brain drain»

Experimenting in Trikala

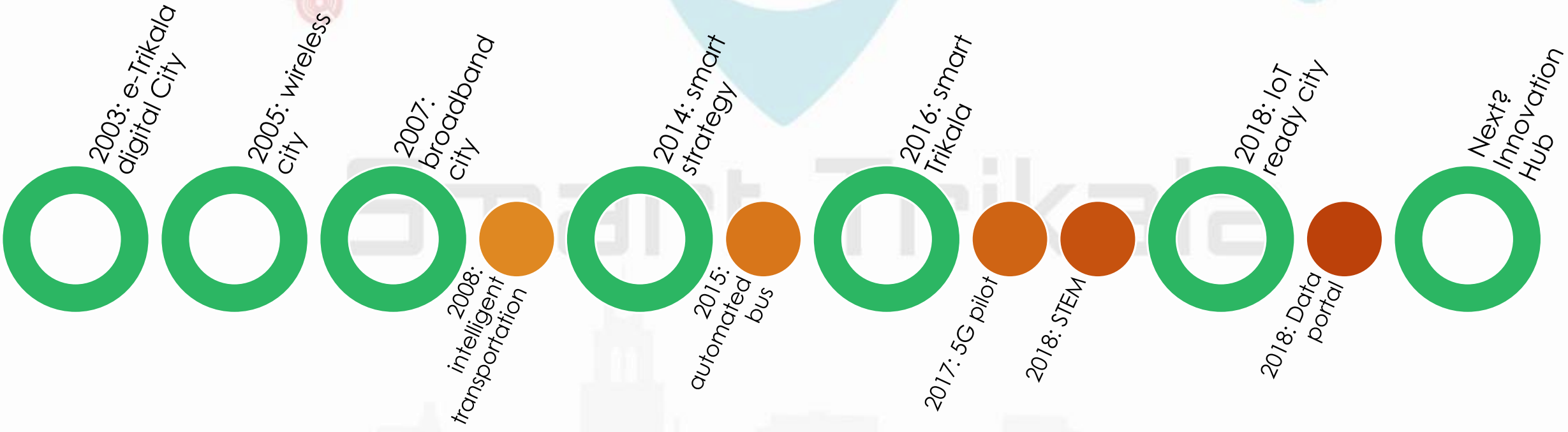
Opportunities

- Brand new transportation networks
- Regional Mobility
- Regional Innovation Strategy (RIS3)
- International recognition
- Emerging technologies (STEM, precise architecture etc.)

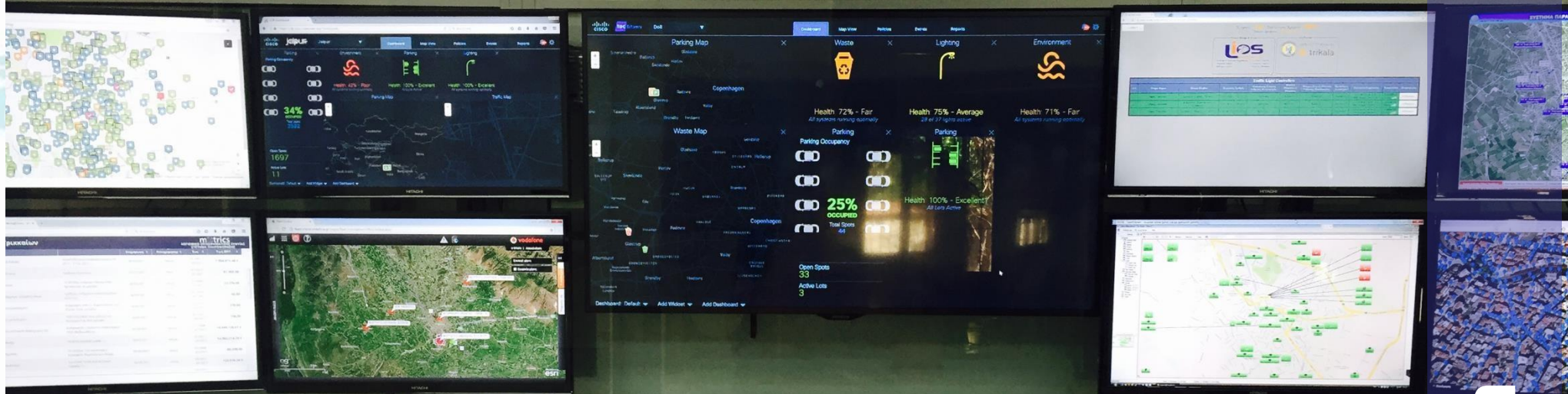
Threats

- Political and economic uncertainties
- Changes in tertiary education
- Climate change effects to local GDP
- Immigration and community changes

Trikala: a brief smart story



Wi-Fi

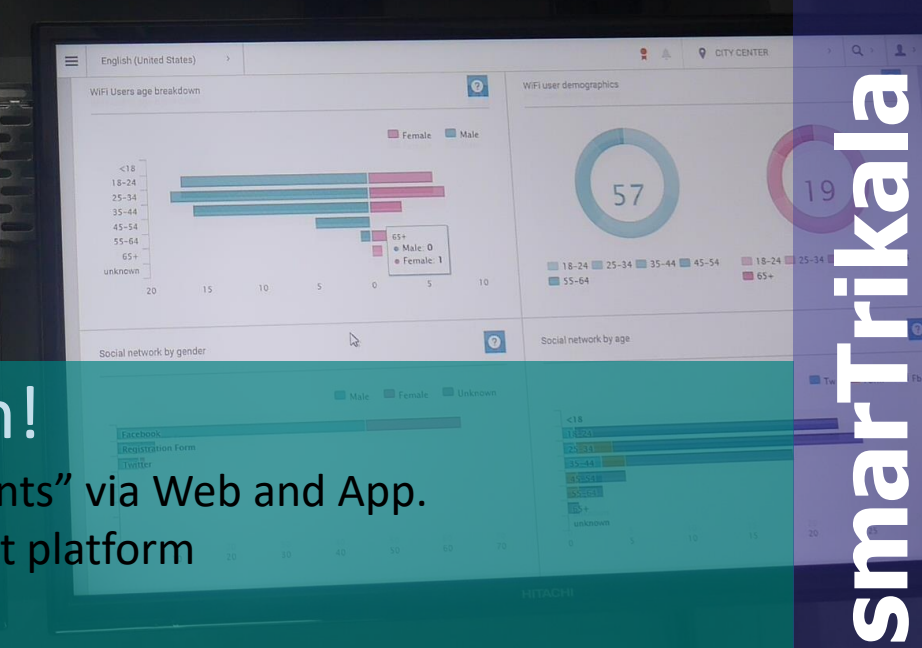
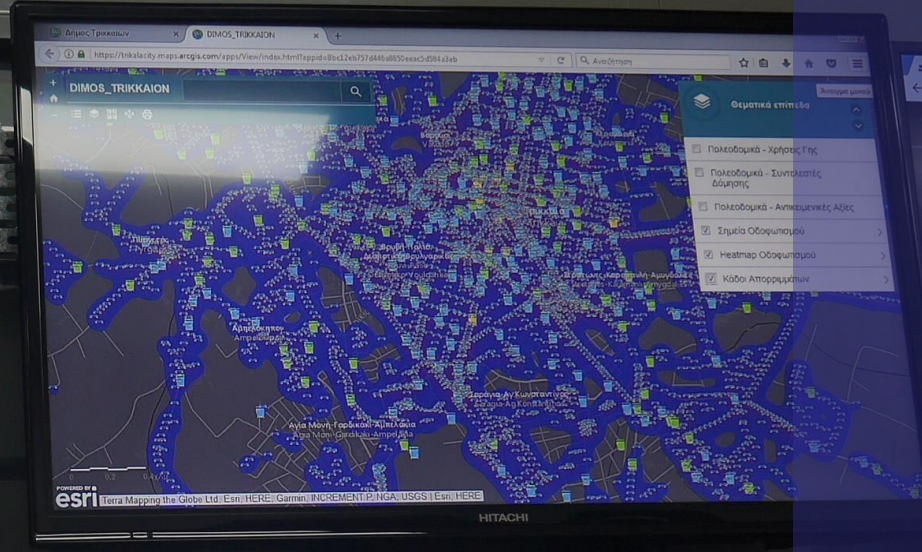
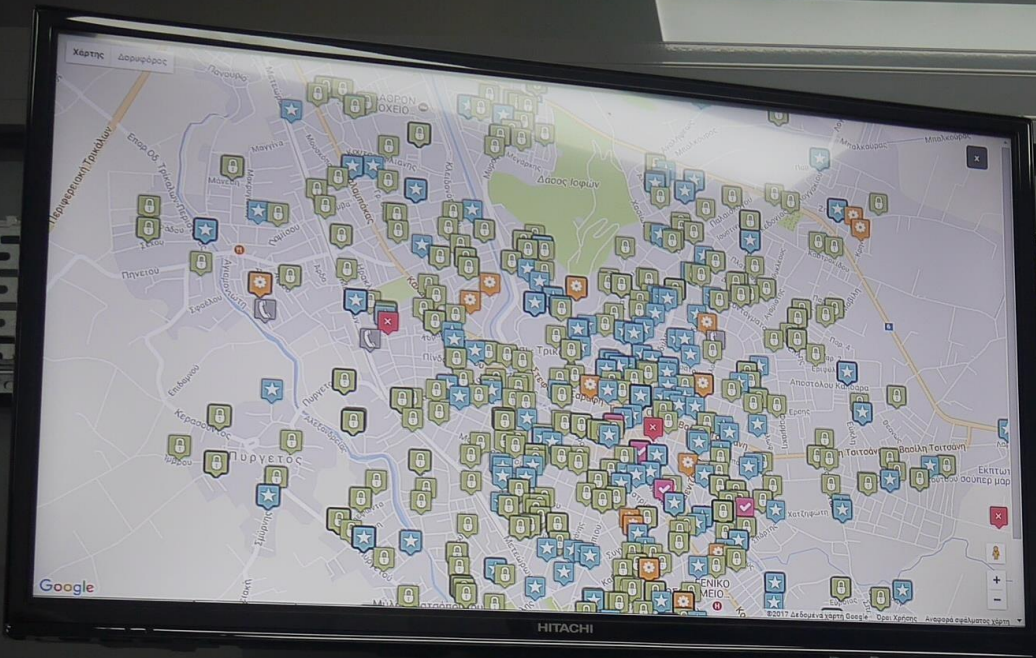


Municipal control room

Although the long “smart” story, the citizens were listening to “smart solutions” but they didn’t receive “smart” result! That’s why we installed the Municipal control room at the entrance of the City Hall.

So that they can realize that technology can truly improve their life!

smarTrikala



A brief tour in the control room!

Municipal call center- Citizen claims and “complaints” via Web and App.
 Fleet management; GIS; Metro-WiFi management platform

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4.854

requests
2017

4.590

requests
2016



71%

were solved
(2016-2017)

57%

had to do with
city lights

60%

solved in less than 10 days



btm intelligent traffic light management

Δήμος Τρικκαίων Control Room #1#

Current User : trik User ID : 00004

Επίπεδο Πρόσβασης : USER Level [-X]

Α.Α.	Όνομα Φύλακα	Όνομα Κιβωτίου	Στοιχείο Αριθμός	Κατεύθυνση Είσοδο	Κατεύθυνση Εξόδου	Προβλ. Ημερομηνία	Είδηση	Παραπομπή
1	Τρικάλων	Καλαμά & Καραϊσκάκη	0110D 2E 8217 00 00 70	Κατεύθυνση	Κατεύθυνση	Κλασική	Κατεύθυνση	Απομαρξάκης
2	Τρικάλων	Απολλωνία & Καλαμάκη	0109 0E 8217 00 00 97	Κατεύθυνση	Κατεύθυνση	Κλασική	Κατεύθυνση	Απομαρξάκης
3	Τρικάλων	Γαυδαλίν & Οθωνία	0118C 1F 8117 00 00 58	Εξέχ. Πλάκα	Κατεύθυνση	Κλασική	Κατεύθυνση	Απομαρξάκης
4	Τρικάλων	Καλαμάκη & Σπυριδίου	01181 81 25 18 00 00 01	Κατεύθυνση	Κατεύθυνση	Κλασική	Κατεύθυνση	Απομαρξάκης

ΣΥΣΤΗΜΑ ΠΑΡΑΚΟΛΟΥΘΗΣΗΣ ΣΤΑΘΜΩΝ ΔΙΚΤΥΟΥ ΤΡΙΚΑΛΩΝ

ΣΤΑΘΜΟΣ ΕΣΤΕΡΙΚΟΥ ΔΙΚΤΥΟΥ ΣΤΕ 11 (ΠΡΟΣ ΠΥΡΓΕΤΟ) ΤΥΠΟΥ Γ

ΕΙΔΟΣ ΠΥΡΓΟΥ	ΕΠΙΦΑΝΕΙΑ ΟΡΟΦΗΣ	ΕΠΙΦΑΝΕΙΑ ΟΡΟΦΗΣ
ΠΥΡΓΟΣ	13657 m ²	0 m ²
ΠΥΡΓΟΣ ΤΡΙΚΑΛΑ	83191 m ²	60729 m ²

BY USAGE

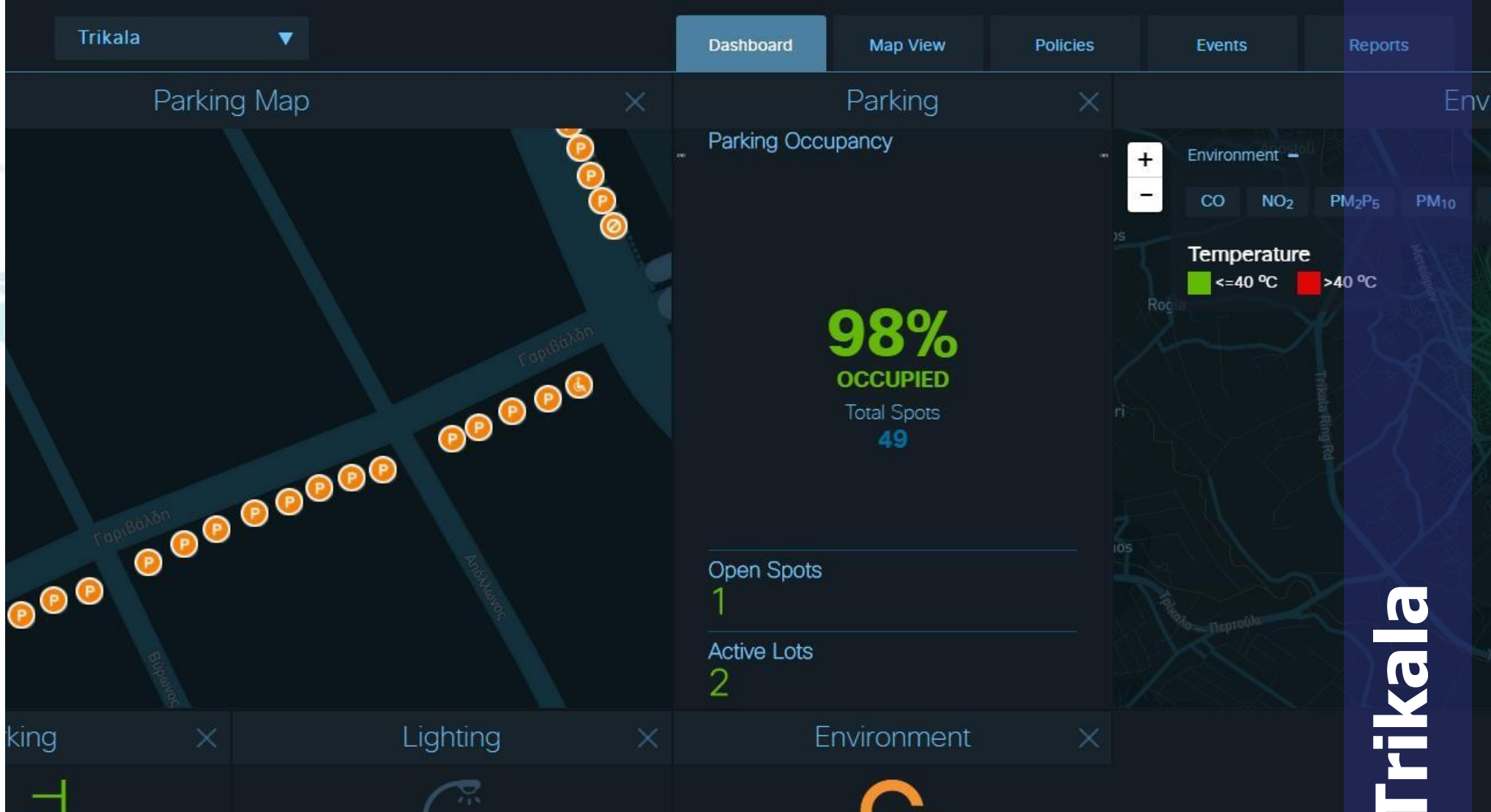
Name	Clients
1 Android	3
2 Android-LG	1
3 Android-HTC	1

PARKGIRI

Εισαγάγετε μια τοποθεσία

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A brief tour in the control room!
 Traffic lights' control system; Smart parking
 Municipal budget progress on our open data section
 Water pipe network's remote control system
 Street light remote control system, through Cisco API's (Kinetic)



A brief tour in the control room!

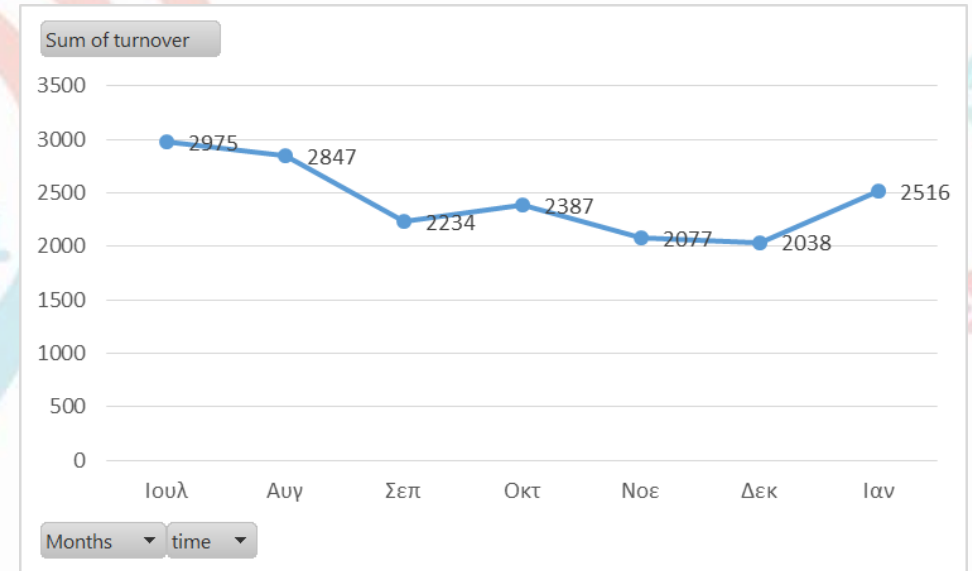
The “heart” is Cisco Kinetic, where most of the above systems are integrated and data is collected and analyzed (lighting, parking, environmental monitoring)

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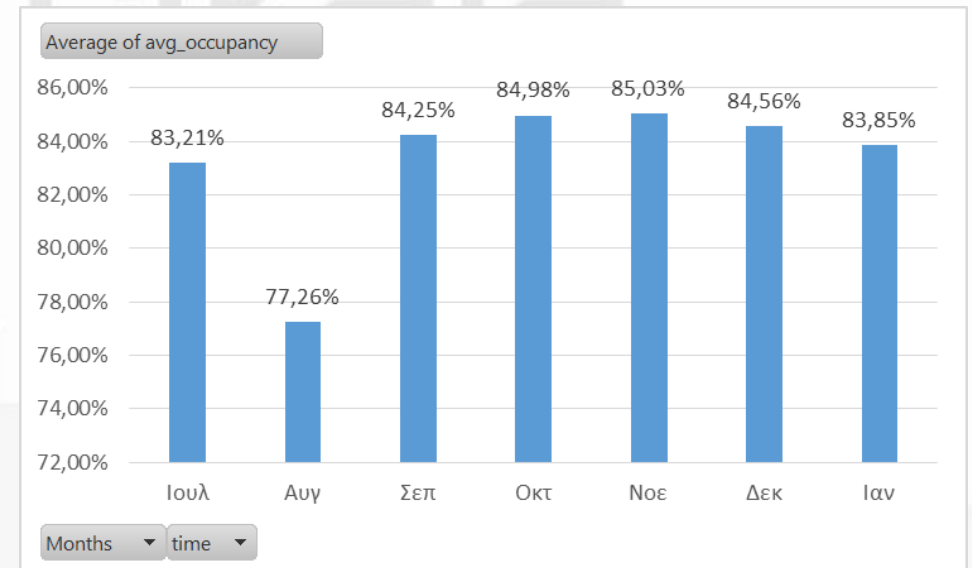
Trikala Results – Parking

- 17.074 sessions (Jul '17 - Feb '18)
- 83,3% avg occupancy (aprx 90% 8:00am-8:00pm)
- 4,3h avg duration
- 1.190 parking violations (150/month) - at Othonos, only 1 sensor

Parking Sessions per month



Occupancy per month



1Y projection

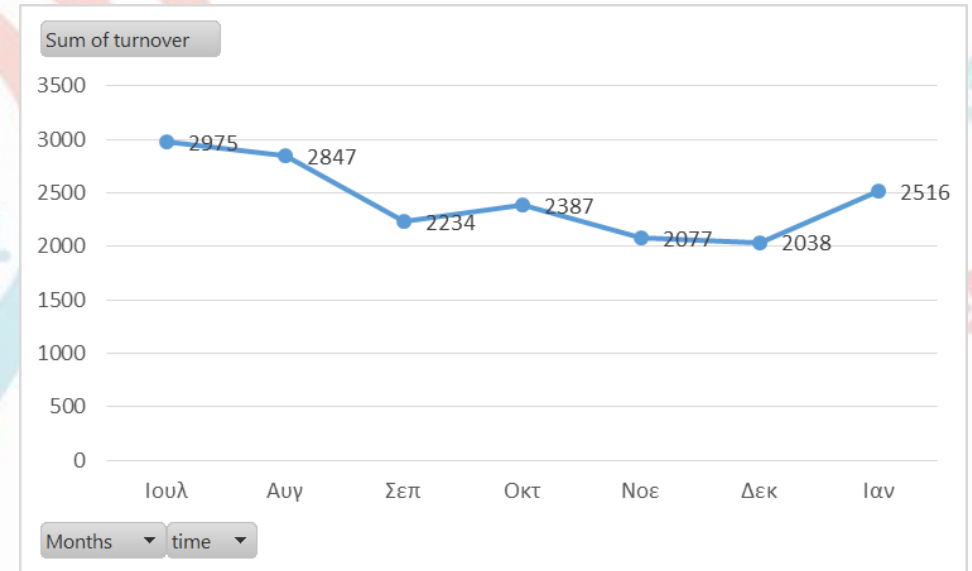
Parking

- occupancy (aprx 90% 8:00am-8:00pm)
- $365 - 52 * 2 - 31 = 230$
- 1 euro : $230 * 11 = 2,530$ euros
- 0.5 euro : $1,265$ euros

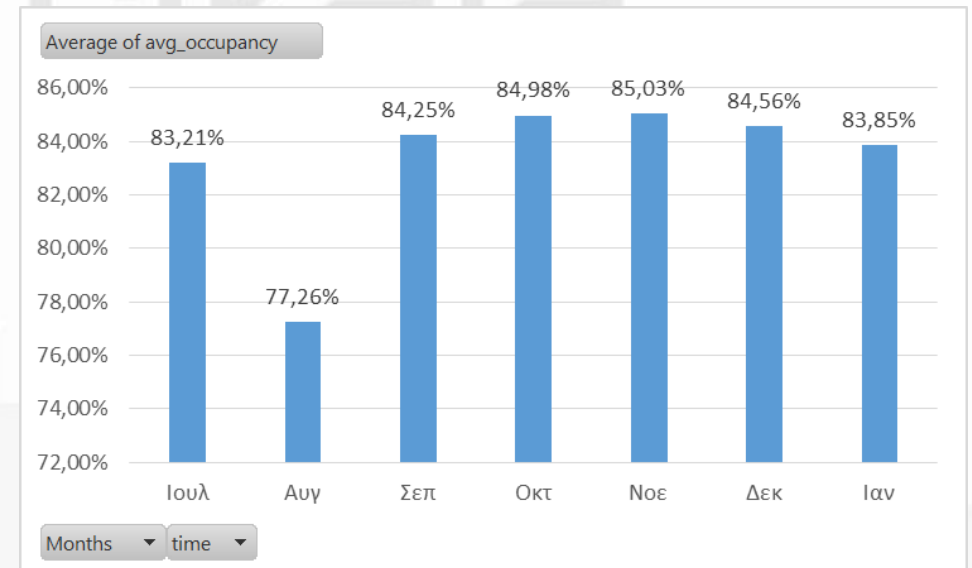
Violations

- 120-150 per month / per lot
- $11 * 135 * 20$ euros = $29,700$ euros

Parking Sessions per month



Occupancy per month





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Citizen Self Service

Documents like certificates of birth, residency, and many others can be retrieved with the use of a NFC card (UnixFor)



Πλατφόρμα Διαβούλευσης Δήμου Τρικάλων

Αρχική Τι είναι Συμμετοχή Επικοινωνία Μάθε Ιστοσελίδα

Σε εξέλιξη: #Διαβ
κατο



Public Consultation
It is "smart" to count your citizen's needs, it is even smarter to make them happen if you can!

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Συμμετοχή στη διαβούλευση



GOVERNANCE



FINANCE



CITY PLANNING



TRANSPORTATION



ENVIRONMENT



SOCIAL CARE



EDUCATION



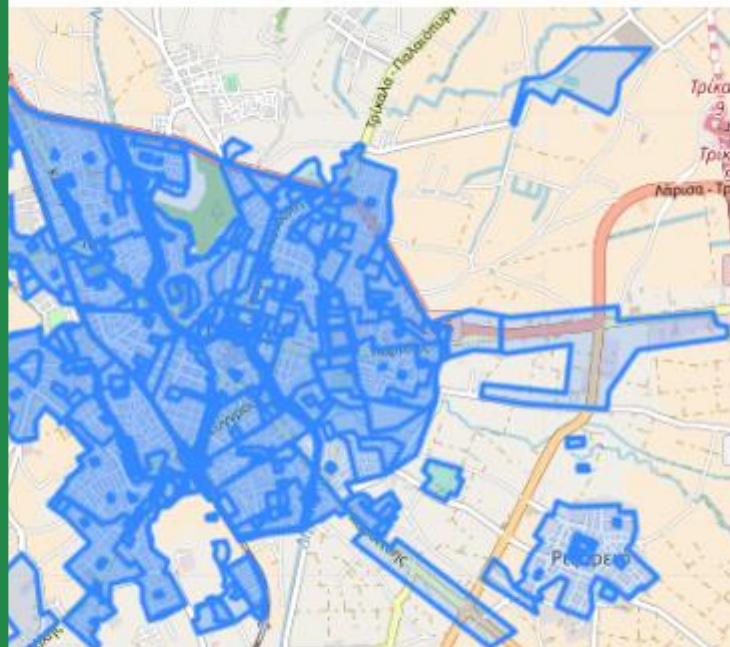
CULTURE



ATHLETICS



ENTERTAINMENT



Πολιτοδομία (5)

Παιδεία (4)

Αθλητισμός (3)

Πρόνοια (3)

Ψυχαγωγία (1)

Ετικέτες

Τύποι Αρχείων

Άδεια Χρήσης



Συλλογικά Όργανα

Διακυβέρνηση Οικονομία

Παρουσιάζονται τα συλλογικά όργανα, οι συνεδριάσεις τους και οι αποφάσεις τους

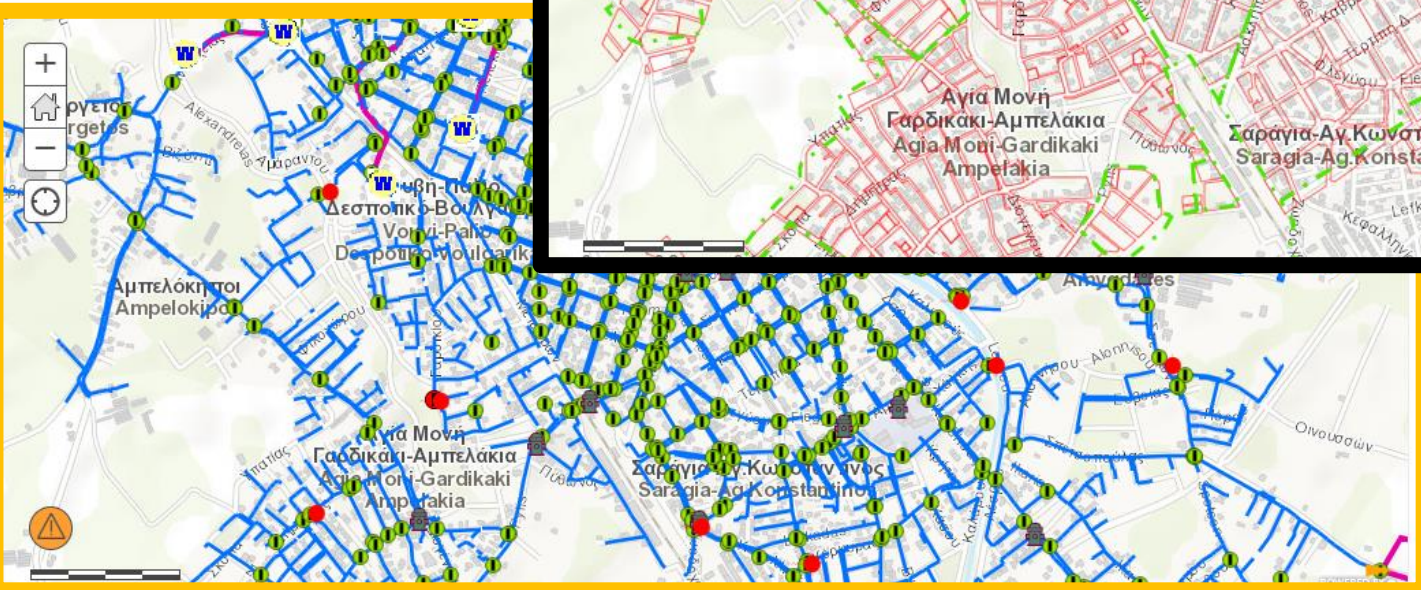
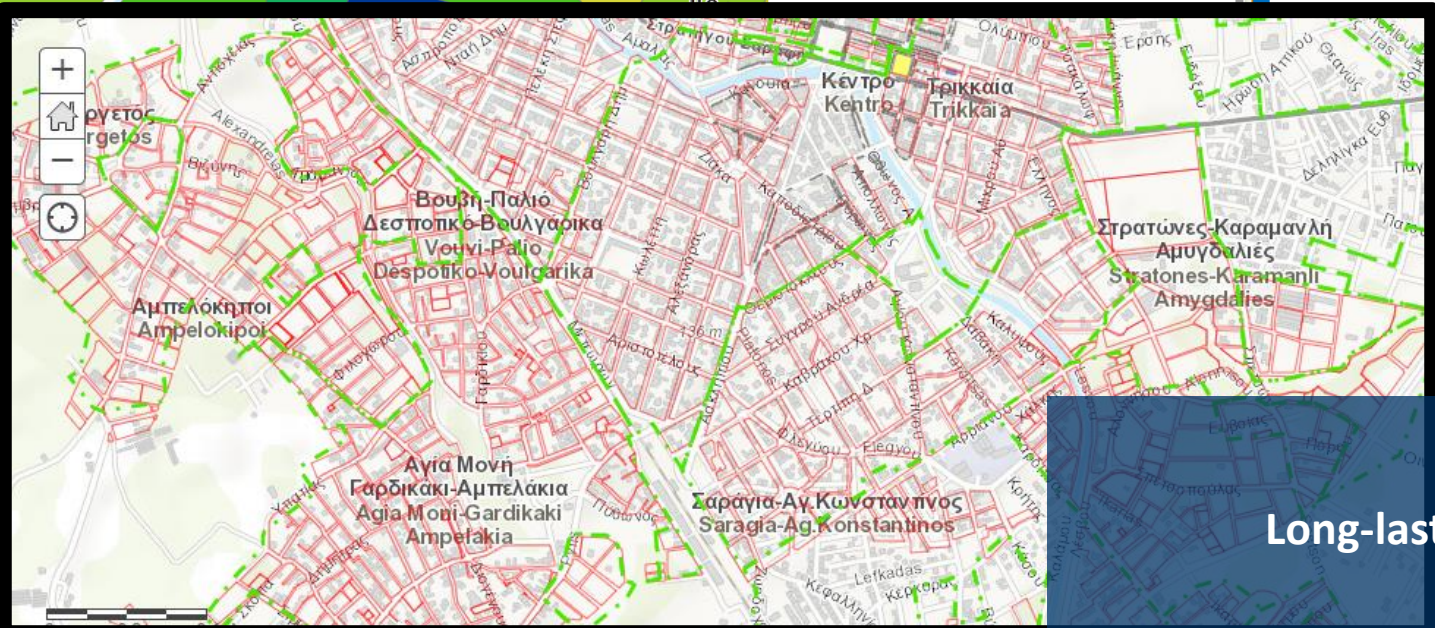
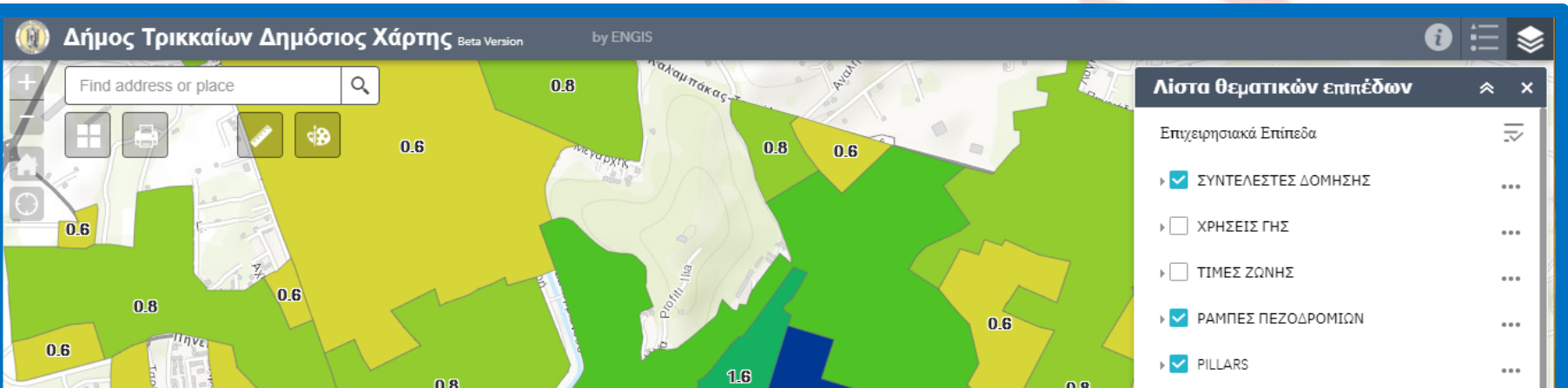
6x json

Open Data
<https://data.trikalacity.gr>

Sept. 2018: 67 datasets

several formats (json, geoJson, xml etc.)

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GIS

Long-lasting project

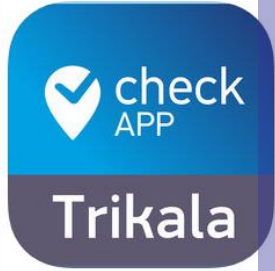
Sept. 2018:
 more than 15 layers for
 internal use
 10 open layers for end users



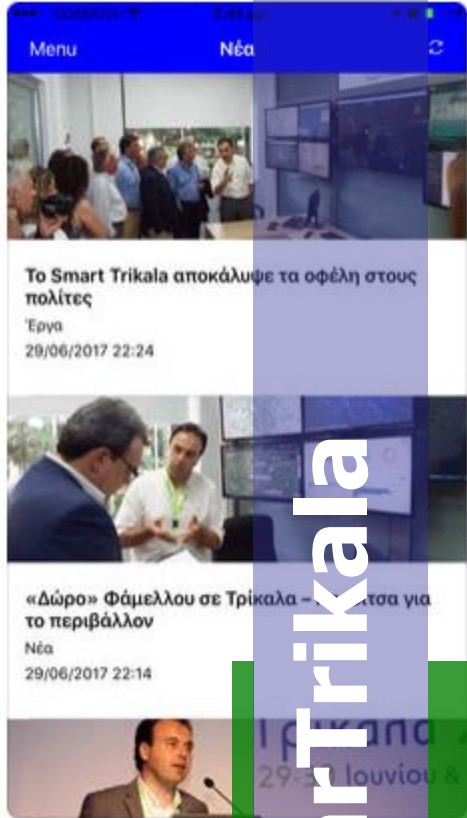
Fleet management
 30 vehicles
 real-time monitoring
 annual route analysis
 Servo

More than 30% fuel savings

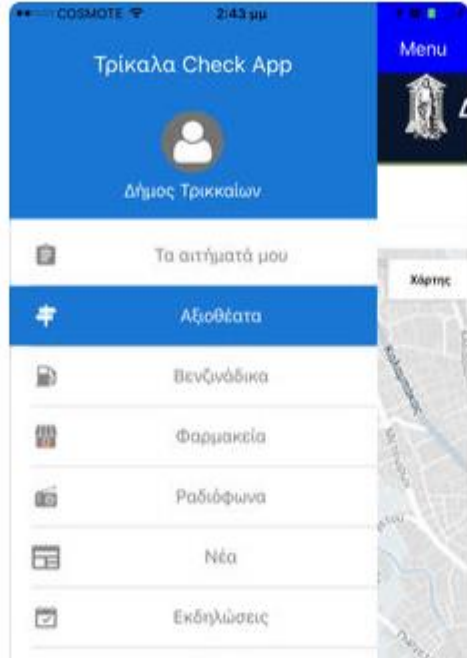




Trikala Check App 4+
MUNICIPALITY OF TRIKALA
Free



smartTrikala



The city ... at the citizens' hands!

- Complaints registration
- News/Events/Points of Interest etc.
- Online payments
- Consultation



Plision ¹²⁺
ENVIRELECTRIC
Free



PARKGENE - Free Parking App

PARKGURU Ltd Χάρτες και πλοήγηση

★★★★★ 125

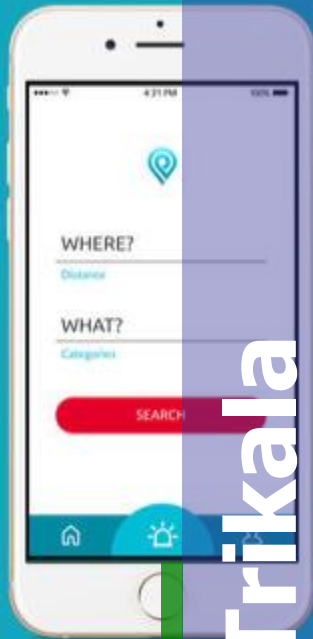


Don't waste time and money looking for a parking spot.

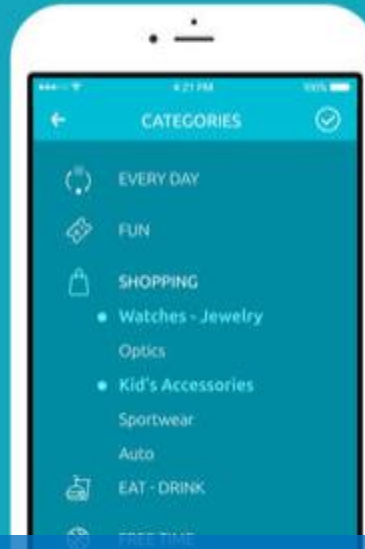
PARKGENE smart, fast affordable parking to bring tips!



Find what you are looking for around you!



Choose what you need.



Save for later what you are interested in.



Discover the offers and hot spots in the area.



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Other apps!

Plision: volunteer management / market location

Parkguru: smart parking in the city

Novel ones on the go with the use of open data





Skills

We recently distributed several STEM kits to all the public schools:
55 Mindstorms Lego kits,
50 WeDo 2.0 Lego kits,
60 Arduino Starter kits
and trained teachers in
partnership with
WRO Hellas



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Skills

We launched the project “Code Girls” in partnership with the US Embassy of Greece for high school girls

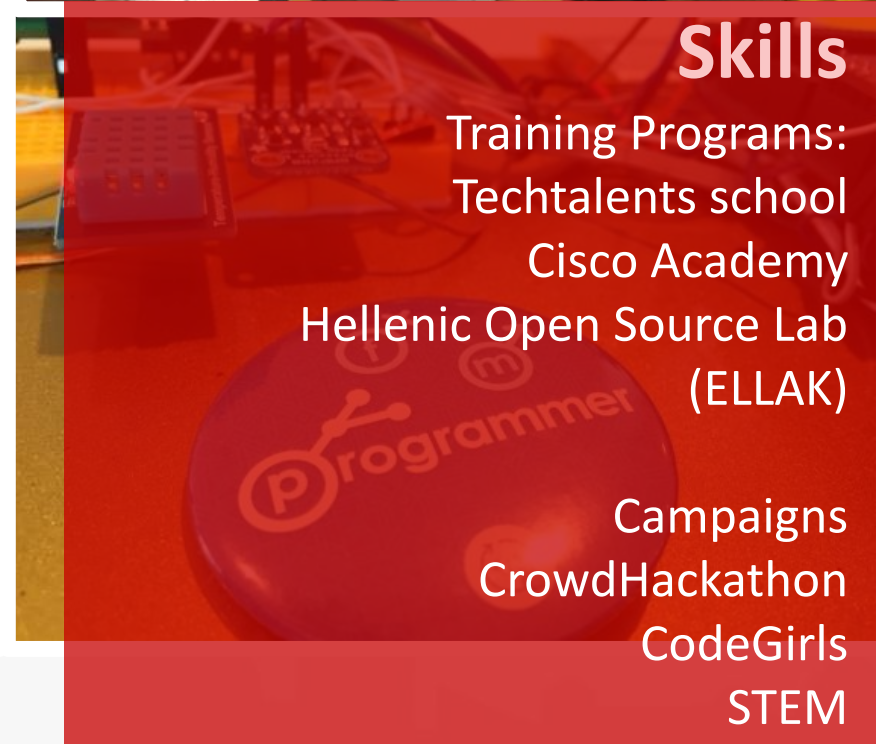
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Skills

Training Programs:
Techtalents school
Cisco Academy
Hellenic Open Source Lab
(ELLAK)

Campaigns
CrowdHackathon
CodeGirls
STEM



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Let's... get smarter!

The Smart Trikala project was launched in 29/06/2017



ΑΙΘΟΥΣΑ
ΔΗΜΟΤΙΚΟΥ
ΣΥΜΒΟΥΛΙΟΥ



Smart Trikala



COSMOTE 10:23 πμ 88%

SPEEDTEST™

PING
12ms

DOWNLOAD

UPLOAD



50.12
Megabits



Hosted by: Vodafone Greece

Walk in the city!
Free WiFi (Cisco APP)
Open Mall application

smarTrikala



2004

started

50 Mbps

upload/download

35

Gb per day

570

Users per day



65

Access
points

Walk in the city!



New LED street lighting
with diming sensors.

Smart parking
underground sensors

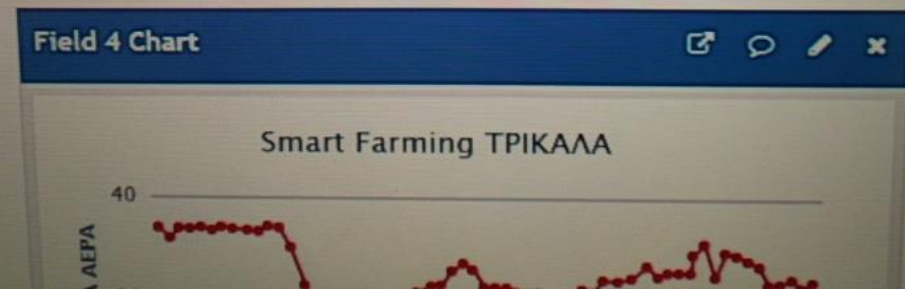
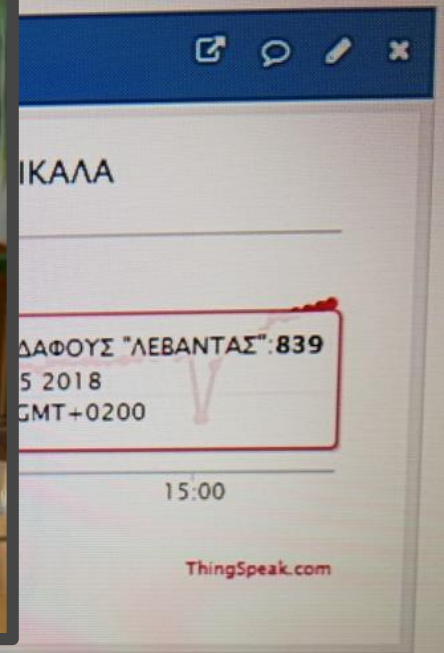
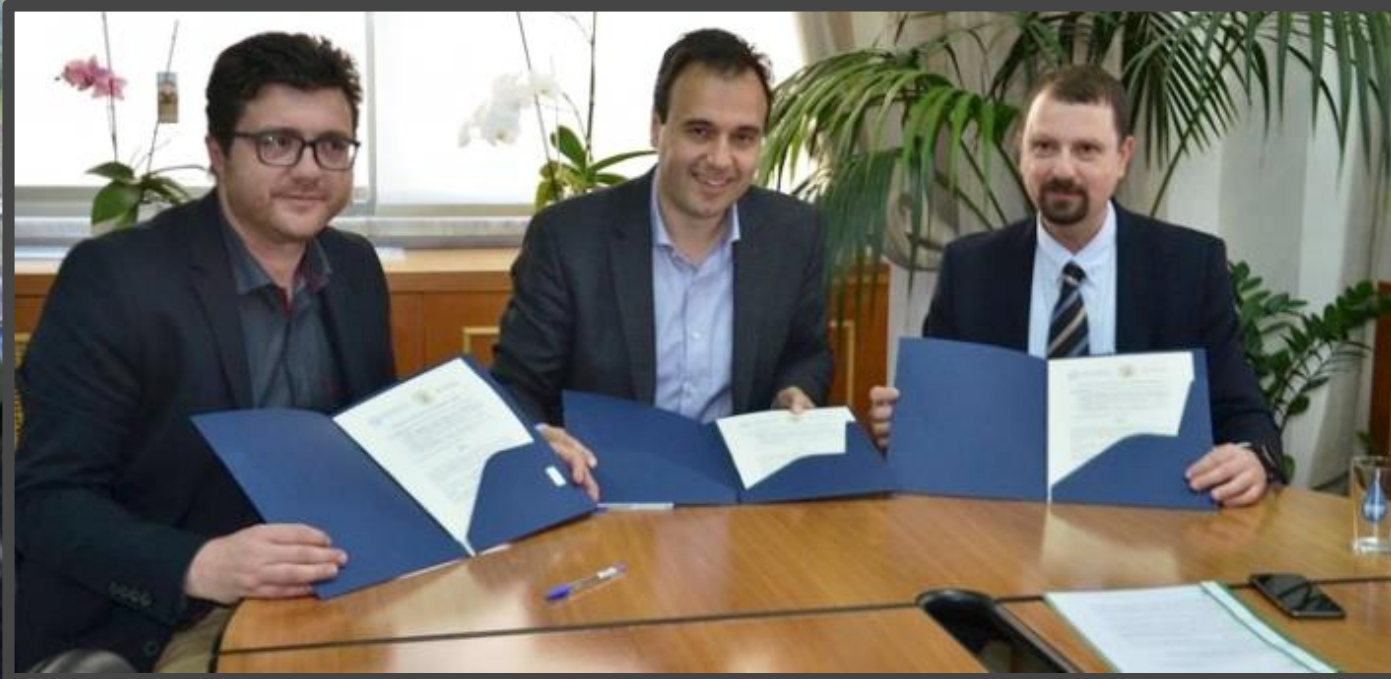
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Some reporting

	EXISTING INSTALLATION	PROPOSED SOLUTION
	NATRIUM LIGHT	LED LIGHT
Lighting Picture		
Πραγματική υπολογισμένη Κατανάλωση Φωτιστικού	287,5W	76,70 W
LED flow lighting source	33.200 Lm (Natrium Bulbe 250 W / PHILIPS)	10600 Lm
Lm / LOR	23.572 Lm (LOR=0,71)	8900 Lm (LOR =0.84)
Bulbe Performance / LED Source	132 Lm/W	138 Lm/W
Lighting Performance	82 Lm/W	116 Lm/W
Life Duration	24.000hr (10% Θνησιμότητα Λαμπτήρα)	>70.000hr (L80, TM-21 @25°C)
Resistance to dust and water	IP55	IP 66
Resistance to vandalism / impact	IK 08	IK 09
CCT	2000 K	4000 K
CRI	25	70
DALI Connection	NO	YES
Ability of autonomous operation on 5 Lighting Levels	NO	YES
Other certificates	NO	ENEC
Quality Certificate	--	ISO 9001
Environmental Protection Certificate	--	ISO 14001
Energy Consumption kWh/1000h	287,5 kWh	78 kWh
MEASURED ENERGY CONSUMPTION kWh/1000h	287,50	76,70
ESTIMATED ENERGY CONSERVATION		>70%
MEASURED ENERGY CONSERVATION		73,32%

Emerging technologies!
Precise agriculture testing beds
IoT network (LoRa)
The first Greek 5G pilot





Walk in the city!

Beacons for smart city tours.

You only need a physical web browser on your smartphone

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Walk in the city!

When you need printed public certificates
and you don't have time to get them!

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Walk in the city!

CityMobi2 driverless buses
pilot project (FP7)

6 months

6 buses

1.490 itinerary

3.580 kilometers

12.138 passengers





Please contact me for more information.

lanthopo@teilar.gr

<http://smart.trikalacity.gr>

Thank you for your attention!



http://de.teithessaly.gr/story/en-US/108/ANTHOPOULOS_Leonidas_Associate_Professor.html

<https://scholar.google.gr/citations?user=oh6zqcUAAAAJ&hl=el&oi=ao>

https://www.researchgate.net/profile/Leonidas_Anthopoulos,

<https://gr.linkedin.com/in/https://gr.linkedin.com/in/leonidasanthopoulos>

