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Do Floods Attack Cities or Cities Invade Flood plains?

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- Introduction
- Methodology of the estimation of flood plains in Attica region
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Introduction (1)

The steps of the flood risk study in Attika region [1, 2, 3]

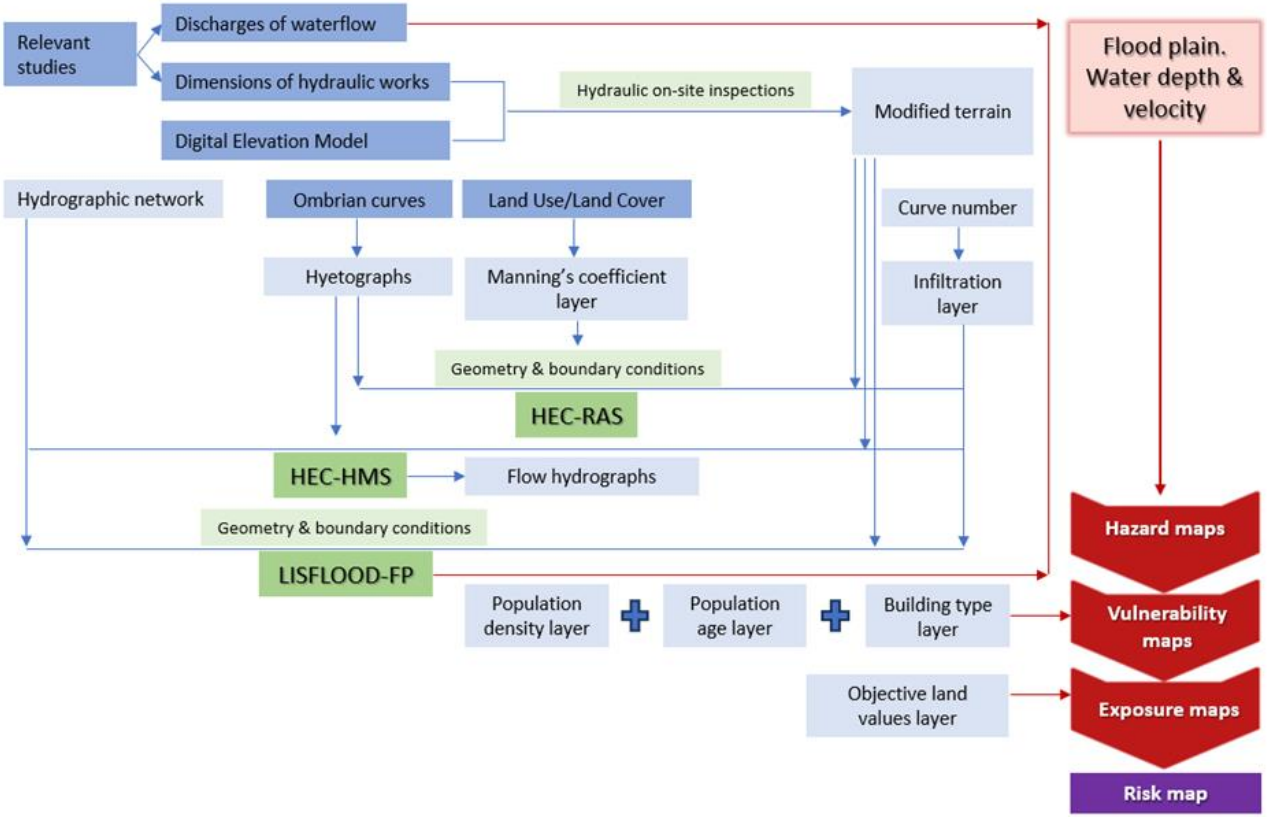
- Hydrological study, involving the estimation of the design rainfall, the rainfall's temporal distribution, including infiltration losses, as well as the final rainfall-runoff transformation.
- Digital Elevation Model (DEM), which is a prerequisite for modern hydraulic studies derived from either orthophotos of very high resolution or satellite images and lidars.
- Analysis of the DEM and verification of the consequence of the hydraulic function. Terrain modifications needed to be done using the HEC-RAS software.
- When the needed information was not enough, complementary information was necessary for the construction of the DEM. We included the satellite imagery (from Google Earth) in our studies providing landmarks to the research team for making field inspections, according to the relevant methodology.
- Field research input was provided by our research teams of specialized engineers to the engineers who modified the terrain accordingly.
- A 2-dimensional hydraulic model was developed by hydraulic engineers for describing the flood evolution in floodplain and for finally assessing the flood hazard and risk.

Introduction (2)

Do flood attack cities or cities invade in flood plains?

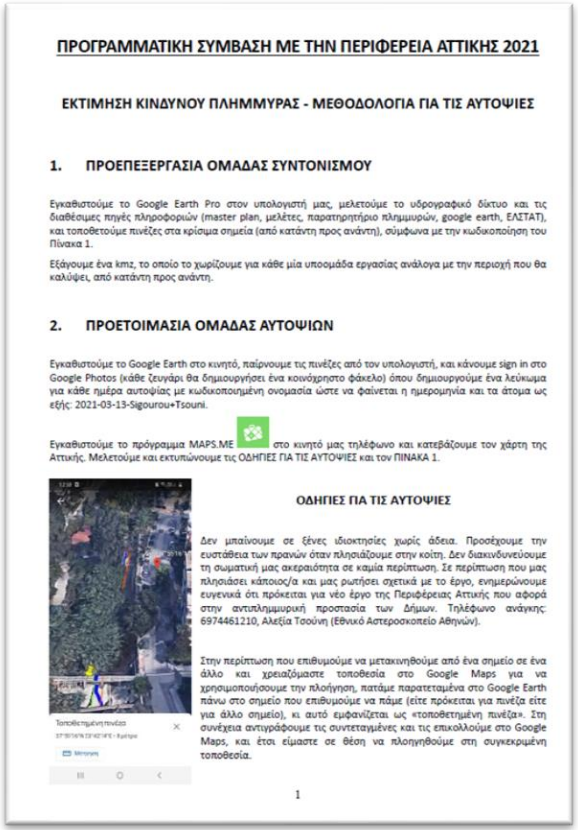
- The 20th century witnessed a profound transformation in landscapes, marked by an unprecedented surge in urbanization [4, 5, 6].
- This phenomenon, while emblematic of progress and modernization, also brought about a significant disconnection from historical legacies and traditional wisdom [7, 8].
- Among other contributions, this knowledge protected people from building infrastructures within riverbeds and floodplains, as it contained the experience from historical (and sometimes mythical) flood-events and disasters.
- In present, civil engineering infrastructures, and primarily dams, have provided protection from floods [9, 10] as we can easily derive from the number of flood fatalities, which have been highly reduced since the beginning of the 20th century.
- However, cities are still prone to flood-related disasters since their expansion has greatly overlapped with flood-plains as we present in case study of Athens.

Methodology for the estimation of flood plains



[1, 2, 3]

Methodology for the field research



ΠΡΟΓΡΑΜΜΑΤΙΚΗ ΣΥΜΒΑΣΗ ΜΕ ΤΗΝ ΠΕΡΙΦΕΡΕΙΑ ΑΤΤΙΚΗΣ 2021

ΕΚΤΙΜΗΣΗ ΚΙΝΔΥΝΟΥ ΠΛΗΜΜΥΡΑΣ - ΜΕΘΟΔΟΛΟΓΙΑ ΓΙΑ ΤΙΣ ΑΥΤΟΨΙΕΣ

1. ΠΡΟΕΠΕΞΕΡΓΑΣΙΑ ΟΜΑΔΑΣ ΣΥΝΤΟΝΙΣΜΟΥ

Εγκαθιστούμε το Google Earth Pro στον υπολογιστή μας, μελετούμε το υδρογραφικό δίκτυο και τις διαθέσιμες πηγές πληροφοριών (master plan, μελέτες, παρατηρητήριο πλημμυρών, google earth, ΕΛΣΤΑΤ), και τοποθετούμε πινέζες στα κρίσιμα σημεία (από κατάντη προς ανάντη), σύμφωνα με την κωδικοποίηση του Πίνακα 1.

Εξάγουμε ένα kmz, το οποίο το χωρίζουμε για κάθε μία υποομάδα εργασίας ανάλογα με την περιοχή που θα καλύψει, από κατάντη προς ανάντη.

2. ΠΡΟΕΤΟΙΜΑΣΙΑ ΟΜΑΔΑΣ ΑΥΤΟΨΙΩΝ

Εγκαθιστούμε το Google Earth στο κινητό, παίρνουμε τις πινέζες από τον υπολογιστή, και κάνουμε sign in στο Google Photos (κάθε ζευγάρι θα δημιουργήσει ένα κοινόχρηστο φάκελο) όπου δημιουργούμε ένα λεύκωμα για κάθε ημέρα αυτοψίας με κωδικοποιημένη ονομασία ώστε να φαίνεται η ημερομηνία και τα άτομα ως εξής: 2021-03-13-Sigourou+Tsouni.

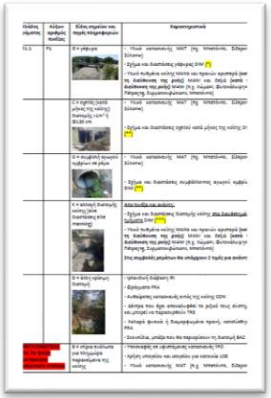
Εγκαθιστούμε το πρόγραμμα MAPS.ME στο κινητό μας τηλέφωνο και κατεβάζουμε τον χάρτη της Αττικής. Μελετούμε και εκτυπώνουμε τις ΟΔΗΓΙΕΣ ΓΙΑ ΤΙΣ ΑΥΤΟΨΙΕΣ και τον ΠΙΝΑΚΑ 1.

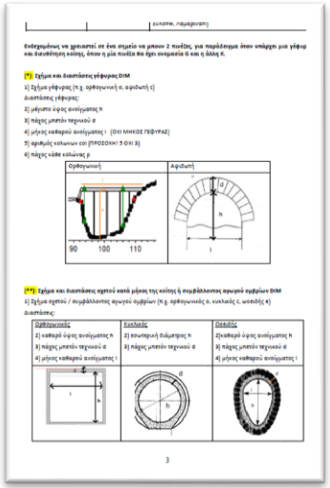
ΟΔΗΓΙΕΣ ΓΙΑ ΤΙΣ ΑΥΤΟΨΙΕΣ

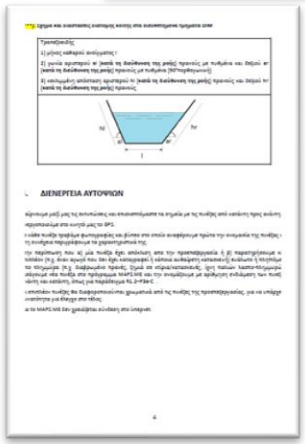
Δεν μπαίνουμε σε ξένες ιδιοκτησίες χωρίς άδεια. Προσέχουμε την ευστάθεια των πρανών όταν πλησιάζουμε στην κοίτη. Δεν διακινδυνεύουμε τη σωματική μας ακεραιότητα σε καμία περίπτωση. Σε περίπτωση που μας πλησιάσει κάποιος/α και μας ρωτήσει σχετικά με το έργο, ενημερώνουμε ευγενικά ότι πρόκειται για νέο έργο της Περιφέρειας Αττικής που αφορά στην αντιπλημμυρική προστασία των Δήμων. Τηλέφωνο ανάγκης: 6974461210, Αλεξία Τσούνη (Εθνικό Αστεροσκοπείο Αθηνών).

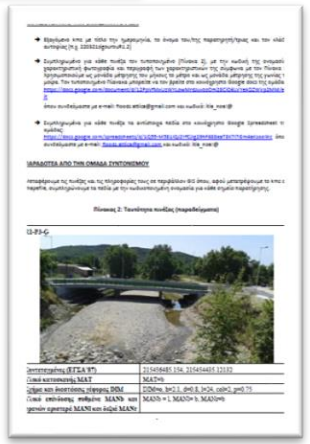
Στην περίπτωση που επιθυμούμε να μετακινηθούμε από ένα σημείο σε ένα άλλο και χρειαζόμαστε τοποθεσία στο Google Maps για να χρησιμοποιήσουμε την πλοήγηση, πατάμε παρατεταμένα στο Google Earth πάνω στο σημείο που επιθυμούμε να πάμε (είτε πρόκειται για πινέζα είτε για άλλο σημείο), κι αυτό εμφανίζεται ως «τοποθετημένη πινέζα». Στη συνέχεια αντιγράφουμε τις συντεταγμένες και τις επικολλούμε στο Google Maps, και έτσι είμαστε σε θέση να πλοηγηθούμε στη συγκεκριμένη τοποθεσία.

1









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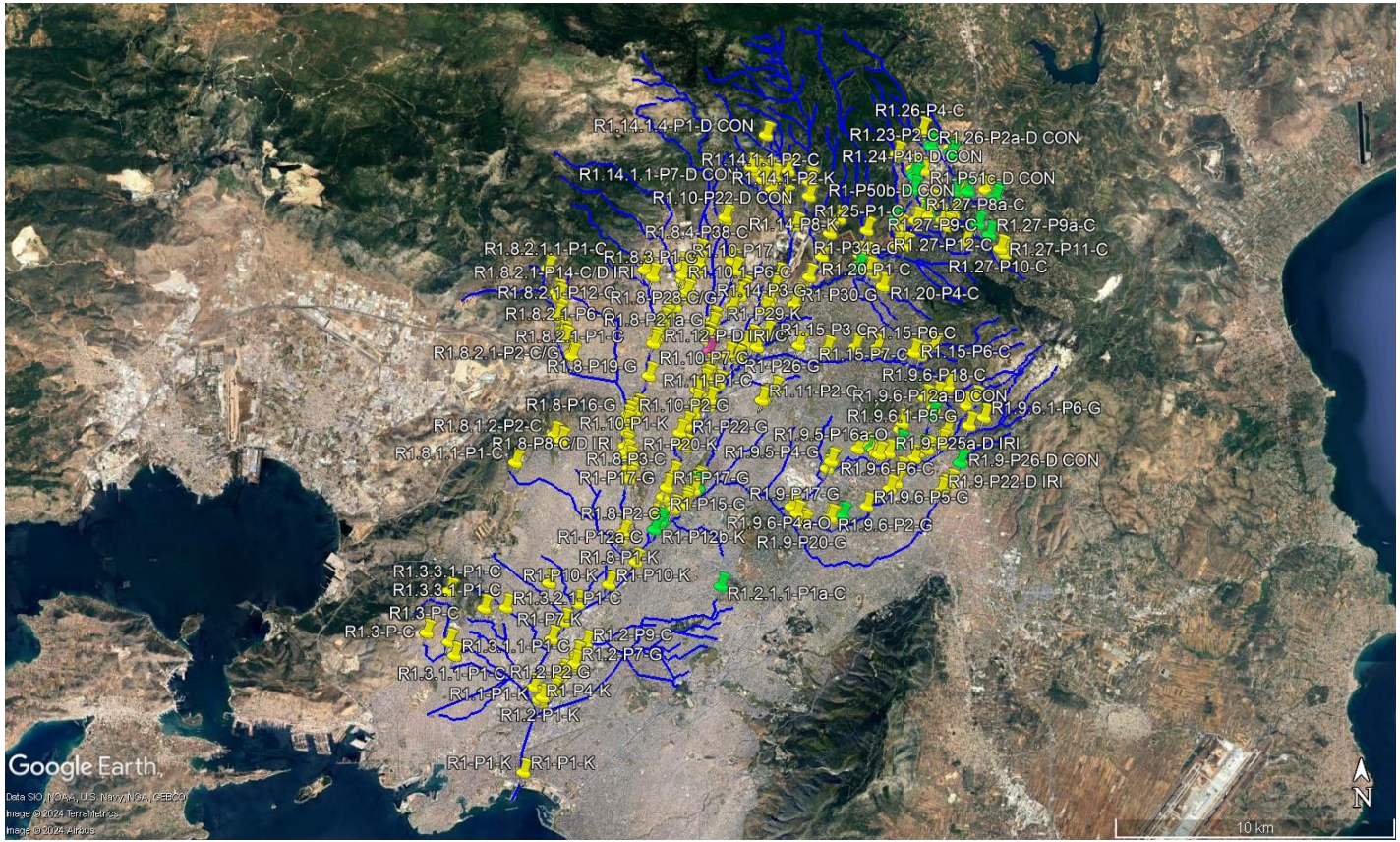
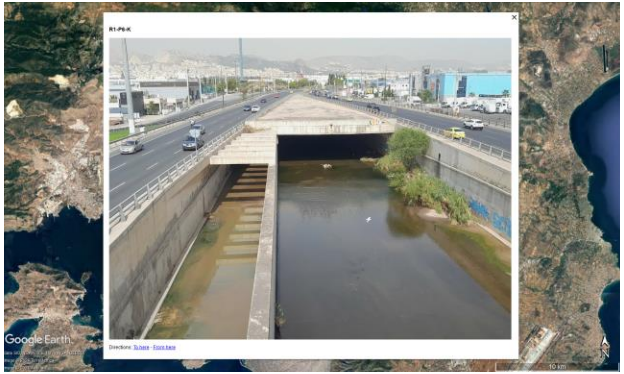
Field research



[1, 2, 3]

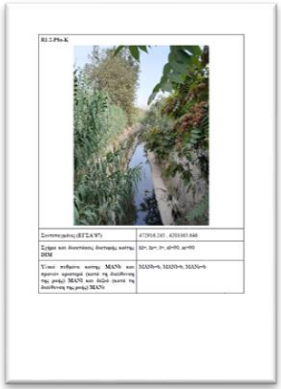
370 positions

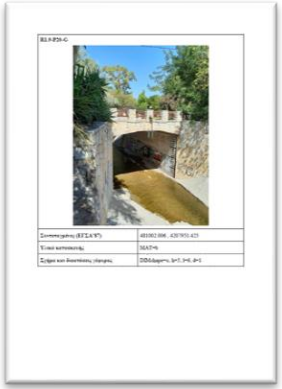
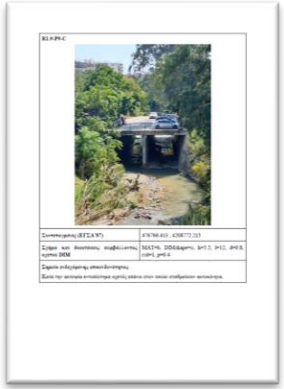
Results (1). Google Earth, Excel

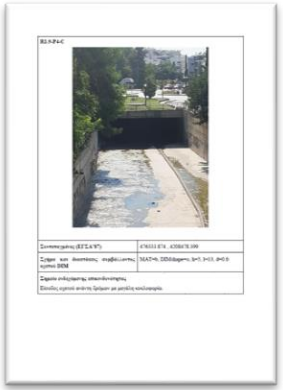
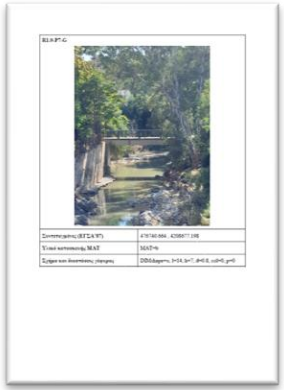
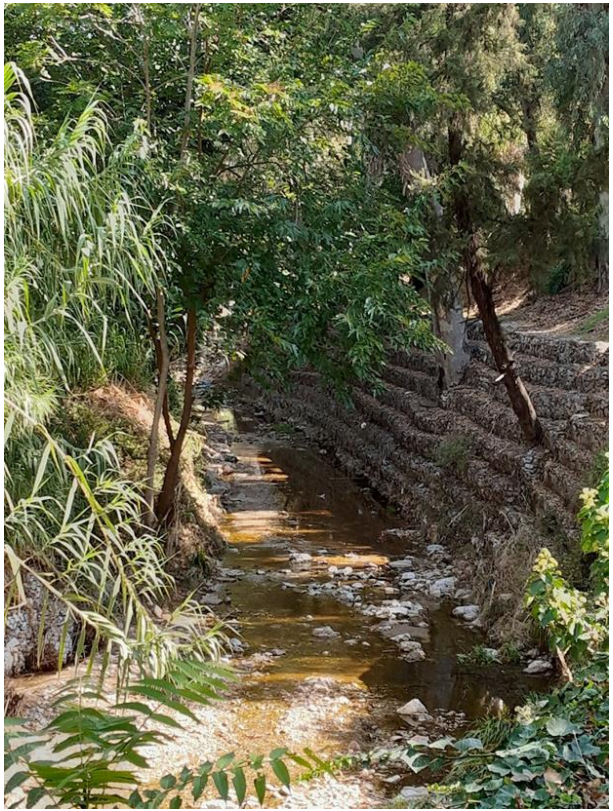


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	W	X	Y	Z	AA	AD
1		MAT	DIM shape	DIM h	DIM d	DIM l	DIM col	DIM p	DIM al	DIM ar	DIM hl	DIM hr	MANb	MANr	MANl	HIGH RISK	description of risk	source	commentsSigourouGoogleEarth	notes	Ημέρα - Ώρα φωτογραφίας
2		(πχ. Μπετόν=b, Σίδερο=f, Ξύλο=w, πλαστικό=pvc)	(π.χ. ορθογωνική o, αψιδωτή a, κυκλικός c, ωοειδής e)	(m)	(m)	(m)	number	(m)	(degrees)	(degrees)	(m)	(m)	(π.χ. Χώμα=l, Φυτοκάλυψη=p, Πέτρες=g, Συρματοκιβώτια=s, Μπετόν=b) ΚΑΤΑ ΤΗ ΔΙΕΥΘΥΝΣΗ ΤΗΣ ΡΟΗΣ			(yes/no)				(περιγραφές, ΧΩΡΙΣ ΠΡΟΣΒΑΣΗ, ΔΕΝ ΕΝΤΟΠΙΣΤΗΚΕ)	
92	R1.8-P25-G																		γέφυρα Εθνικής Αντιστάσεως ΜΕΤΡΗΣΗ	καθώς γίνονται έργα σε εξέλιξη και η διατομή θα διευρυνθεί.	23/09/2023, 12:15
93	R1.8-P26-G																		πεζογέφυρα ΜΕΤΡΗΣΗ	Δεν υπάρχει πεζογέφυρα, έχει υπογειοποιηθεί προσφάτως με τα νέα έργα.	23/09/2023, 12:19
94	R1.8-P27-C	b	o	3.5	1.0	5.5													γέφυρα Κολοκοτρώνη ΜΕΤΡΗΣΗ	Εργασίες υπό εξέλιξη.	23/09/2023, 12:23
95	R1.8-P28-C																		ΜΕΤΡΗΣΗ	Οχετός, υπόγειος, δεν εντοπίστηκε	23/09/2023, 12:38
96	R1.8-P29-C																		ΜΕΤΡΗΣΗ	Οχετός, υπόγειος, δεν εντοπίστηκε	23/09/2023, 12:41
97	R1.8-P30-G			4.0	0.5	6.4	0						l	s	s				ΜΕΤΡΗΣΗ		23/09/2023, 12:44
98	R1.8-P30a-C	b	c	3.0		2x4.0							b	b	b				ΜΕΤΡΗΣΗ	Δίδυμος οχετός.	23/09/2023, 12:45
99	R1-P11-K												l	s	s				συμβολή με [illegible] ΜΕΤΡΗΣΗ	Έργα σε εξέλιξη.	23/09/2023, 12:50
100	Group 3.1																				
101	R1.9.6-P8-G	b	a	3	0.5	5										yes	κίνδυνος σε περίπτωση φραξίματος			όχι καλή μέτρηση λογω έλλειψης πρόσβασης	

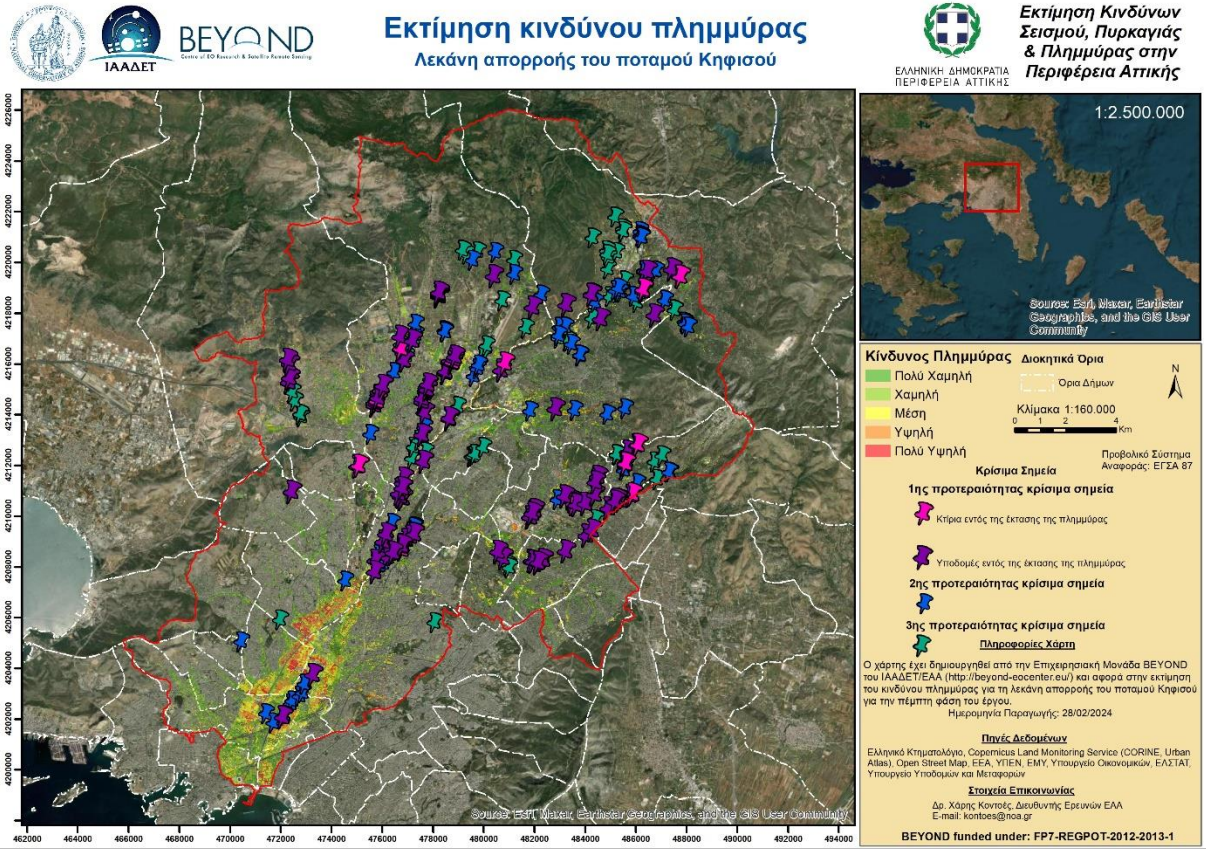
Results (2). Report



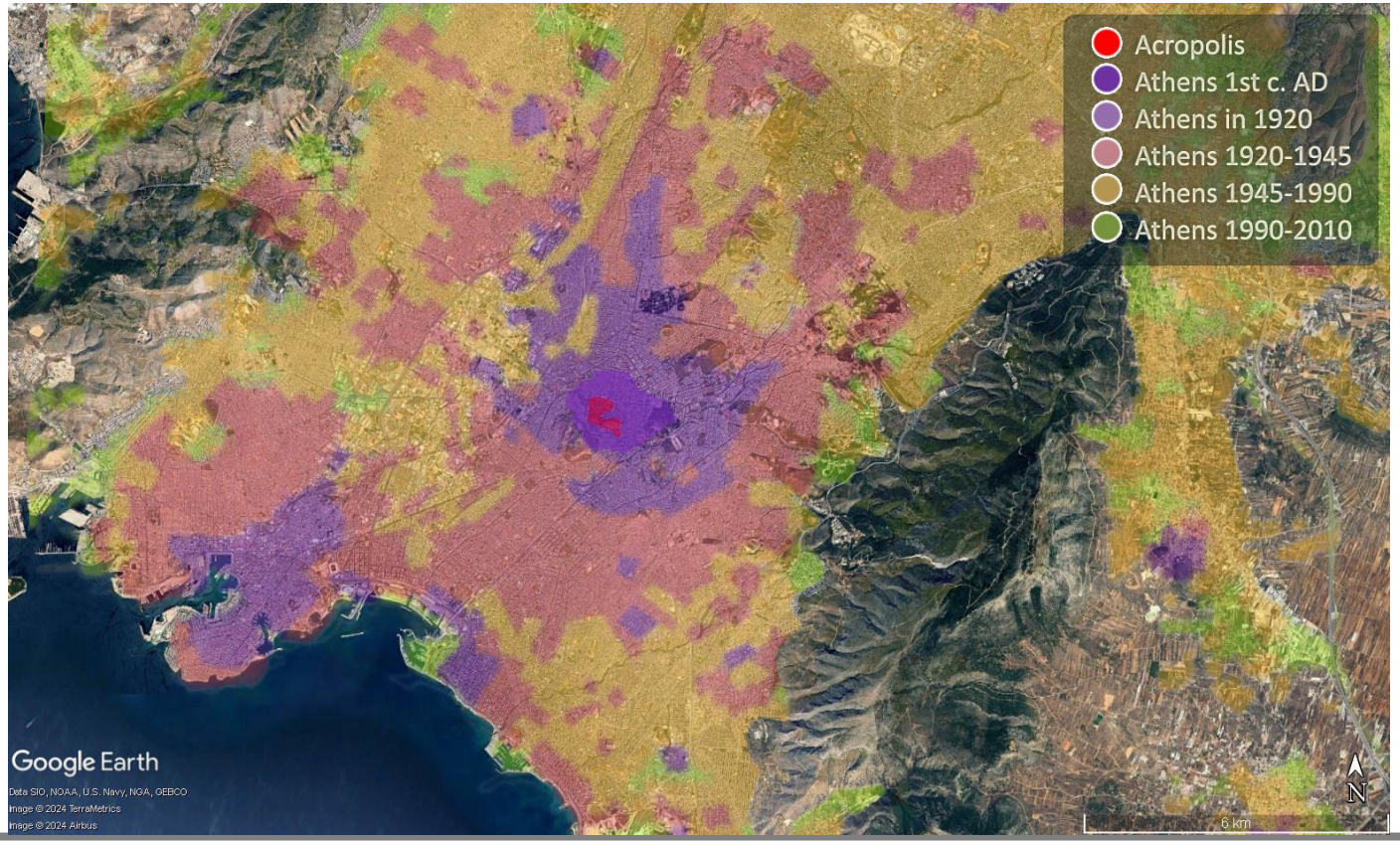





Results (3). Risk maps



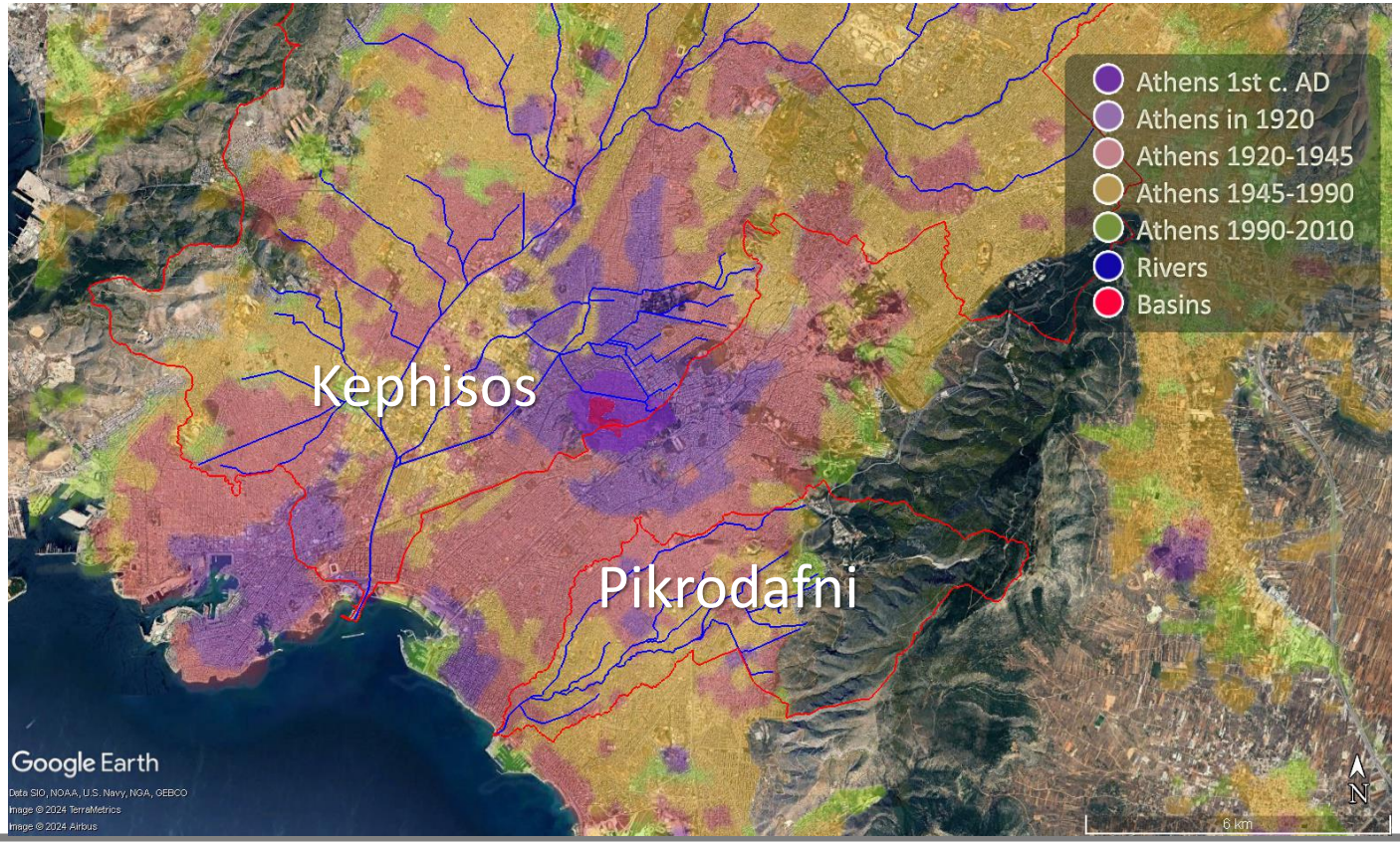
[1, 2, 3]

The temporal evolution of Athens



Map form Google Earth after adaptation [11, 12]

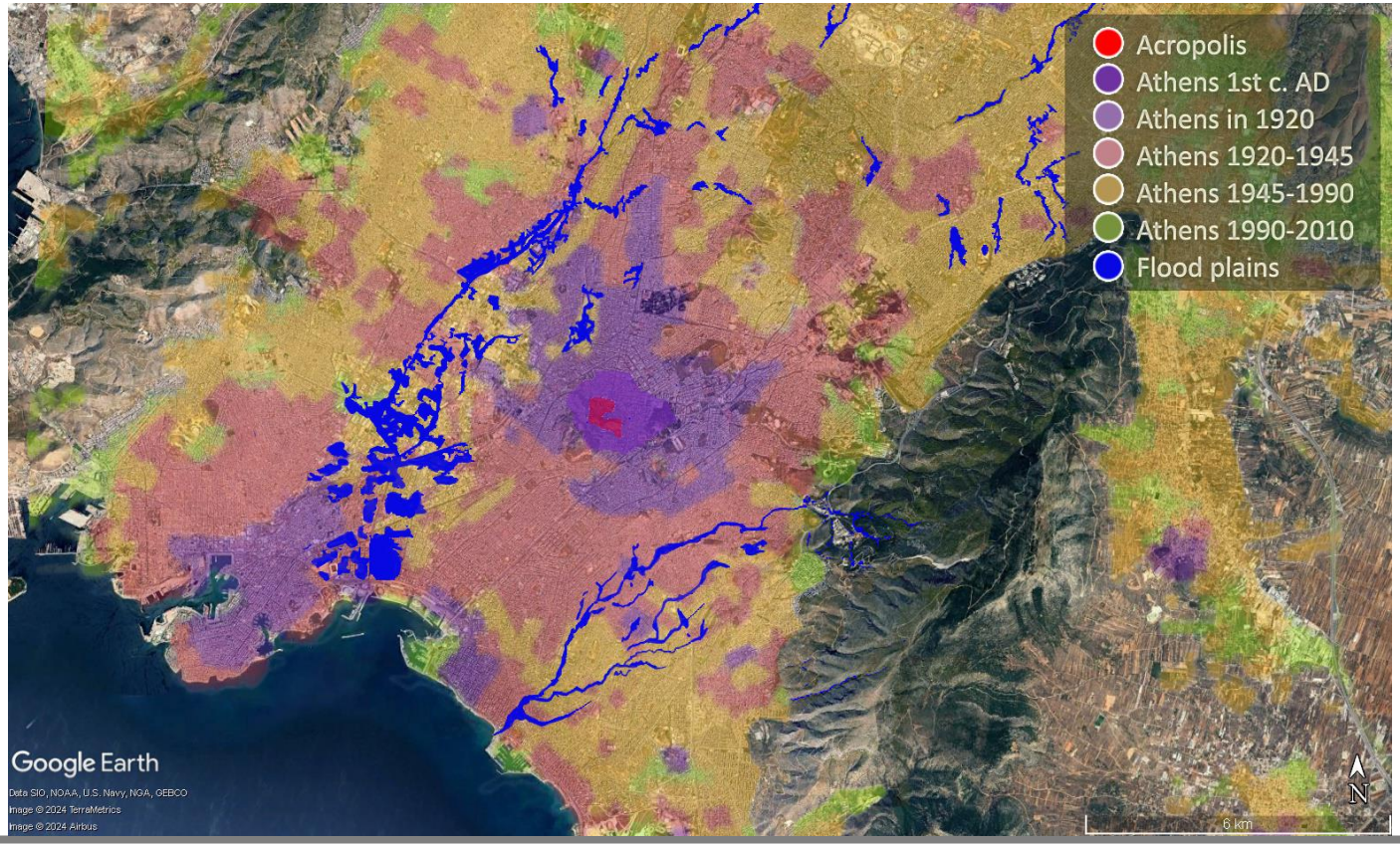
The temporal evolution of Athens and the rivers



Rivers and basins after adaptation [1, 2, 3]

Map form Google Earth after adaptation [11, 12]

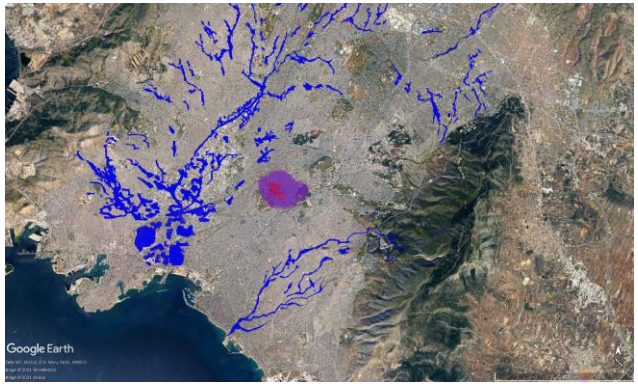
The temporal evolution of Athens and flood-plains



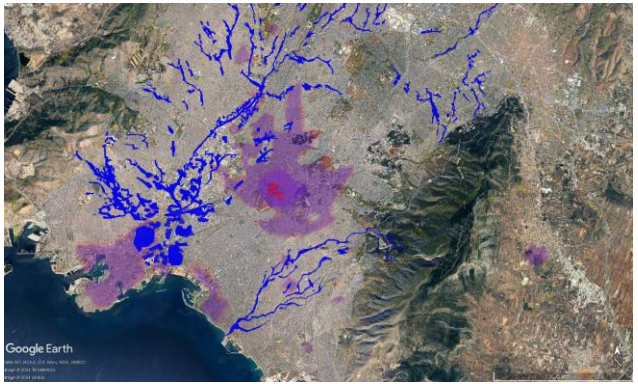
Rivers and basins after adaptation [1, 2, 3]

Map form Google Earth after adaptation [11, 12]

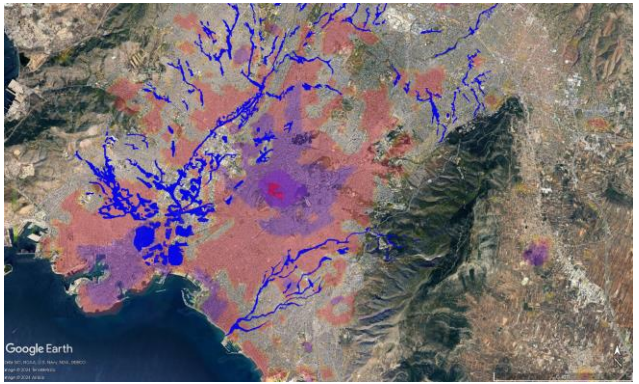
The temporal evolution of Athens and flood-plains



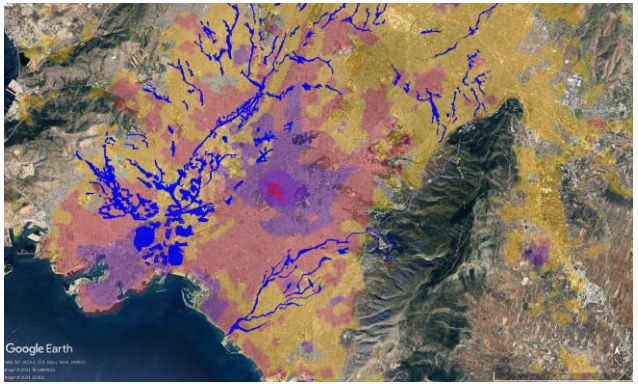
1st century A.D.



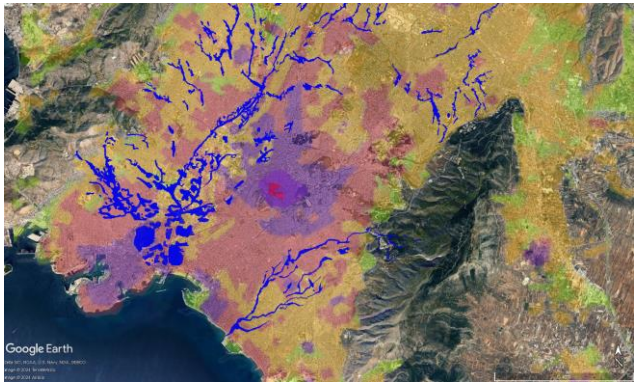
1920



1945



1990



2010

Conclusions

- Figures depicts the temporal evolution of the urbanization of Athens and the evolution in relation to the crucial floodplain areas of Cephisus and Pikrodafni.
- As shown by the evolution of the city, the priority of its development was to be located far from the flood-plains.
- This changed during the rapid expansion of the city between 1945-1990, when the city forcefully encroached into the floodplains of Cephisus and Pikrodafni.
- Athens grew with stochastic dynamics, without a predetermined plan and without appreciating the necessity of infrastructure works.
- The necessary infrastructure works were constructed in a similarly stochastic manner. For example, anti-flood networks were constructed in upstream areas without corresponding infrastructure works downstream, causing the downstream areas more vulnerable to floods.
- Therefore, contrary to the belief that floods attack to cities, we note that, in the case of city of Athens, it is its urban development and growth that invaded into flood plains.

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Acknowledgments

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