

## Flash Floods' Children-Greece

LPS 2022 Climate Detectives School Award Ceremony

### **OUR TEAM: Flash Floods' Children**





Our team consists of 21 children aged 13-15 years old. The students who came to Bonn to represent our team are:

Boutsis Georgios Moudilou Ioli Psoni Dimitra Revisiou Agapi Tsigalos Kyriakos Vasileiou Melina

and our physics teacher Anastasia Evangelopoulou

### Investigating the floods of Ilioupoli (Athens- Greece) (1/4)



**Research question** : How are floods created and what are their effects on the local community of Ilioupoli? What can we do to deal with this issue?



The Municipality of Ilioupoli is located on the southwestern slopes of Mount Ymittos in Athens.



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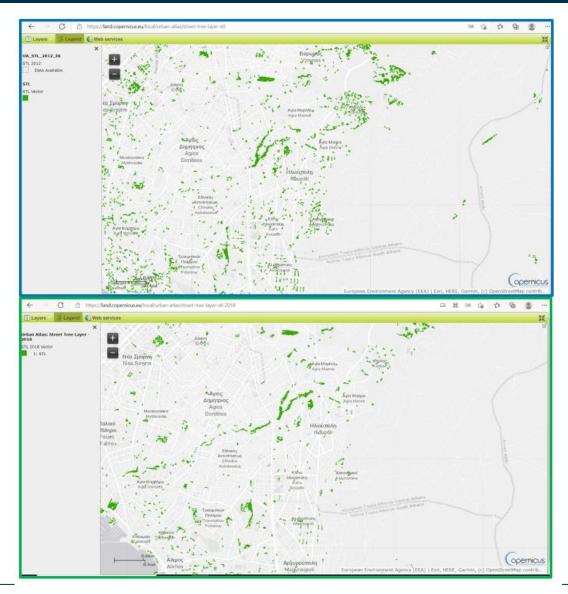




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- Our climate issue is urban flash floods and the following factors contribute to this:
- **1.** The steep slope of the ground.
- 2. The change of land use and of Pikrodafni stream, which is in favor of the urban area at the expense of the environment.



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### Investigating the floods of Ilioupoli (Athens- Greece) (4/4)



- **3. The small forest cover** compared to previous years, **due to the fire in the forest of Ymittos** (2015).
- **4. Sudden heavy rains**, that occurs more often the latest years due to climate change.





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Our team performed laboratory experiments in order to demonstrate how the suburban forests protect cities from floods.



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### Research part (2/2)



We studied the data from the Technical Service of the Municipality of Ilioupoli and local media, we did an autopsy in the Pikrodafni stream and found out:

- > the entire length of the Trahonon stream that crosses llioupoli has been coated,
- many blocks of flats have been built in the historic riverbed of Pikrodafni stream and its natural slopes and vegetation have been destructed.
- many parts of Pikrodafni stream have either clogged, boxed or grounded. The surfaces are smooth, the friction is reduced and the rainwater flows fast before being absorbed!



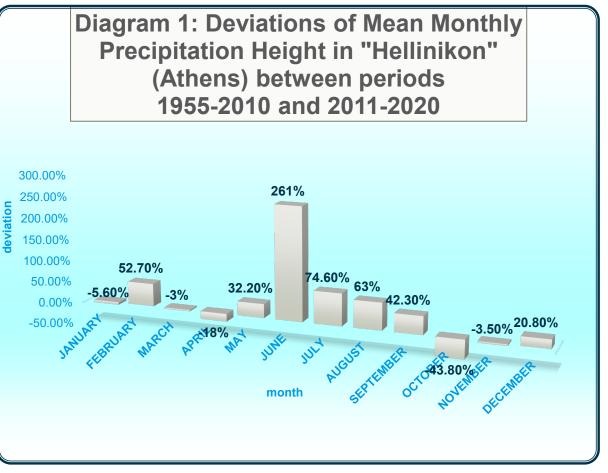


### Data analysis- main results (1/4)



Processing the data from the Hellenic National Meteorological Service (H.N.M.S), for the meteorogical station in "Hellinikon", an area very close to llioupoli, and for a thirty years period (1991-2020) we come up with the conclusions:

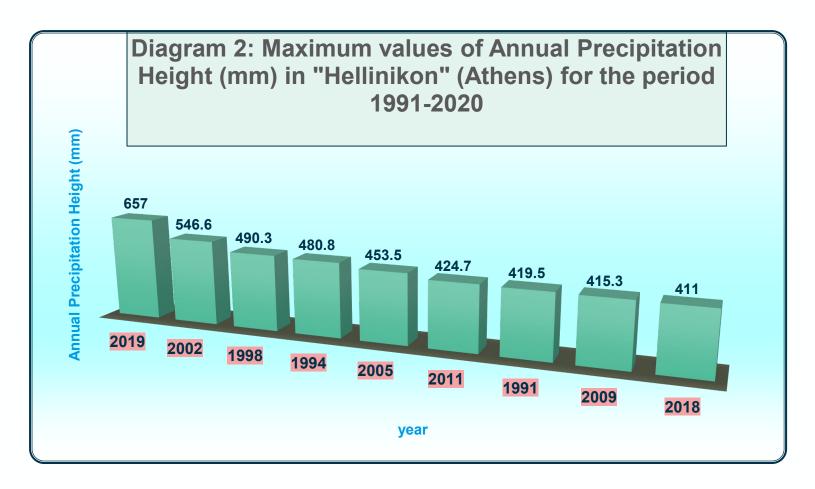
I. There are significant deviations for the mean monthly precipitation height between the decade 2011-2020 and the normal values of the period 1955-2010.



### Data analysis- main results (2/4)



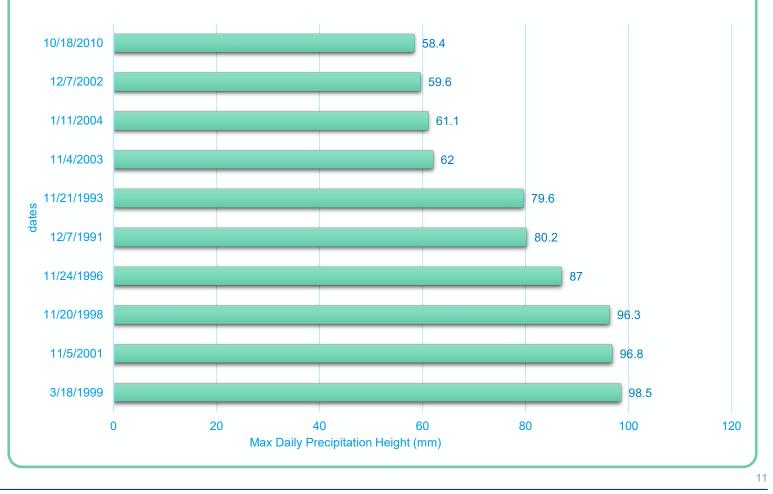
II. There are 9 positive deviations from the mean annual precipitation height (400 mm) during the period 1991-2020. The majority of the years with such an increase in rainfall is after the year 2000.



### Data analysis- main results (3/4)



III.The 10 bigger values of the maximum daily precipitation height. Most of them exceed the mean <u>monthly</u> precipitation height! Diagram 3:Dates of Maximum Daily Precipitation Height (mm) in "Hellinikon" (Athens) for the period 1991-2012



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### Data analysis- main results – case study(4/4)

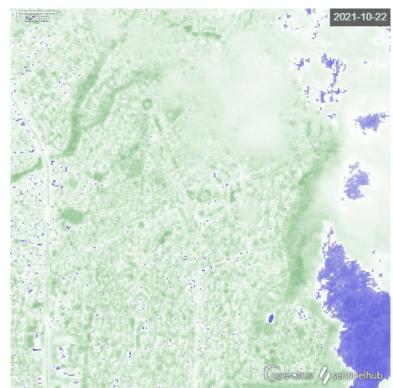


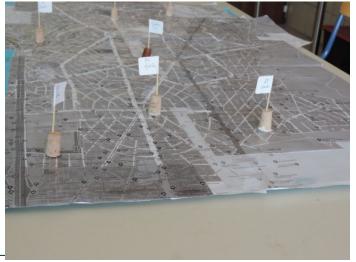
- Analyzing data from the meteorological station of Ilioupoli, we conclude that the annual precipitation height for the year 2021 in Ilioupoli (335.2 mm) was below average (360 400 mm).
- There were months with no or minimum rainfall.
- However, the large amount of rainfall was concentrated in one single month and especially in one day (14<sup>th</sup> October with rain height 94mm!), indicating the consequences of climate change in our town!

### Conclusions (1/2)



- We studied the Normalized Difference Water Index (NDWI) using the EO Browser, for several rainy days of the autumn 2021 and found out the areas where large volumes of rainy water is accumulated.
- This helped us to choose the locations where we set up our 7 "meteorological stations".





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### Conclusions (2/2)



Our in-situ experiments took place a day with low rain intensity (17<sup>th</sup> of April 2022 ), so:

- the improvised rain gauges proved to be of little accuracy compared to the electronic one.
- only 2 out of the 7 stations, managed to collect surface runoff water and took
  - laboratory measurements.









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|                               | Measurements of the 17 <sup>th</sup> April 2022 in Ilioupoli |   |   |   |  |                          |  |
|-------------------------------|--|---|---|---|--|--------------------------|--|
| Meteo<br>rological<br>station | Experiment<br>execution<br>time                              | Duration of<br>rain height<br>measurement | Rain<br>height<br>(mm)  | Rain<br>intensity<br>_Rain height<br>time | Duration of<br>surface runoff<br>measurement | Volume of surface runoff | Surfa<br>ce<br>runoff<br>$Q = \frac{V}{t}$ |
| Control<br>station            | 10:35 a.m.   | 75 min=1.25h                              | <ul> <li>3,1 mm (with the electronic rain gauge)</li> <li>1mm (with the improvised rain gauge)</li> </ul> | 2.48 mm/h                                 | 2min 35 s<br>= 155 s                         | 378 mL                   | 2.44<br>mL/s                               |
| Station 1                     | 10:15 a.m.   | 0.5 h                                     | < 1mm   |   |  | -                        |  |
| Station 2                     | 10:15 a.m.   | 1.5 h                                     | < 1mm   |   |  | -                        |  |
| Station 3                     | 10:15 a.m.   | 0.5 h                                     | < 1mm   |   |  | -                        |  |
| Station 4                     | 10:50 a.m.   | 24 min= 0.4h                              | 3mm   | 7.5 mm/h                                  | 2 min=<br>120 s                              | 166 mL                   | 1.38<br>mL/s                               |
| Station 5                     | 10:15 a.m.   | 0.5 h                                     | < 1mm   |   |  | -                        |  |
| Station 6                     | 10:35 a.m.   | 0.5 h                                     | < 1mm   |   |  | -                        |  |

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### Make a difference (1/5)



1. We informed our students about the sustainable development (especially for the goal 12 & 13). We hung a poster on an external wall of our school and shared leaflets in order our students to inform friends and family about the climate change and raise awareness.



### Make a difference (2/5)



### 2. For the recycling goals, we made art from trash.





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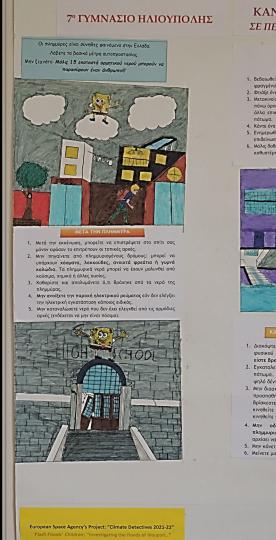
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### Make a difference (3/5)



# 3. Drew a poster with flood instructions.

4. Our team participated to the 1st Youth Assembly for Climate Change (ARSINOE project), organized by Hellenic Foundation for European and Foreign Policy (ELIAMEP) in 12 and 13 May 2022.



#### ΚΑΝΟΝΕΣ ΑΣΦΑΛΕΙΑΣ ΣΕ ΠΕΡΙΠΤΩΣΗ ΠΛΗΜΜΥΡΑΣ

ΠΡΙΝ ΑΠΟ ΤΗΝ ΠΛΗΜΜΥΡΑ

- Βεδιαιωθείτε ότι τα φαράπα έξω από το απίτι σος ένε είναι φαρτιμένα και ούφοροφέ λετανοιχούν κατοινού.
   Φπάξε ένα και έκταντης ανάγκης (νερό, φαικός, ραδιόφωνα) Ματαινείται το ποιροτικό αντικείρισης, ευταίρθητα έγχοραφα στον πάνα όροφο και φυλάξε χρώριστα, ενταριακτίου, λιτάσματα και άλλα ε πικιλότικο υλικό σε πάλατικούς κάδους μαιοριά στο πάτωμα.
   Κάττις ένα αυσκηγεταιοιά σκέδια επικοινωνίας.
- Ενημερωθείτε από τις αρμόδιες αρχές (οδηγίες, ειδήσεις για επιδείνωση καιρού, ραδιόφωνο, τηλεόραση)
   Μόλις δοθεί το σήμα για εκκένωση, εκκενώστε την περιοχή χωρίς
- κολις οσθεί το σημά για εκκενώση, εκκενώστε την περιοχή χω καθυστέρηση.



#### ΚΑΤΑ ΤΗ ΔΙΑΡΚΕΙΑ ΤΗΣ ΠΛΗΜΜΥΡΑ

- Διακόψτε την παρακή ηλεκτρικού ρεύματος, νερού και φυσικού αερίου (μην αγγίζετε ηλεκτρικό εξοπλισμό εάν είστε θρεγμένος ή στέκεστε σε θρεγμένη επιφάνεια).
   Εγκαταλείψτε υπόγειους χώρους και πηγοίσκει στο επάνα πάταμα. Εάν βρίσκατε στο δάσος, σκαρφαλώστε σε ένα υπλά δίντρο.
- φιρώστειρώ. 3. Μην διασχίζετε τρεχούμενο νερό, Εάν είστε μέσα στο νερό, προσπαθήστε να μετακινηθείτε σε στεγνό μέρος. Εάν βρίσκατε σε νερό που ρέει με μιγάλη τανάτητα, μην κινηθείτε πανάντια στο ρεύμα ή προς τη φορά του, αλλά κινηθείτε προς την όχθη με κάποια γωνία προς το ρεύμα.
- Μην οδηγείτε το αυτοκίνητό σας μέσα από πλημμυρισμένες περιοχές και, αν η στάθμη των υδάτων αρχίσει να ανεδαίνει, εγκαταλείψτε το αμέσως.
   Μην κάνετε χρήση υπόγειων διαβάσεων.
   Μείντει μακριά από ηλεκτροφόρα καλώδια.

Η αφίσα είναι δημιουργία του μαθητή του τμήματος Α<sub>3</sub> Απόστολου Ρέτζου

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### Make a difference (4/5)



**5. We participated to the voluntary reforestation of Ymittos**, organized by the Municipality of Ilioupoli (3<sup>rd</sup> of April 2022).





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### Make a difference (5/5)



- 6. We are having a day-event at our school on the 27<sup>th</sup> of May 2022. We shall present to our mayor a written proposal:
- a) Teachers training by experts agronomists how to plant trees,
- b) Organize specific days for each school to plant trees in specific area of Ymittos, so that there would be a fair "competition" between schools,
- c) Put more experimental "meteorological stations" in different locations in Ilioupoli, maintained by school teams, which will process the data and give them to our official meteorological station,
- d) Consider the option to construct pavements that absorb rain water,
- e) Create pocket-parks and rain gardens.



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### Thank you for your attention

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