



CLIMATE DETECTIVES 2021 – 2022



Flash Floods Children
7th Junior High School of Ilioupoli

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?

SUMMARY OF PROJECT

The Municipality of Ilioupoli is located on the southwestern slopes of Mount Ymittos in Athens. The Pikrodafni and the Trachonon stream are flowing our city and are the ultimate rainwater receivers.

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, which is in favor of the urban area at the expense of the environment.
- 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.
- 5.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!

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

We analyzed data from the Hellenic National Meteorological Service (H.N.M.S), for a timeseries of 30 years (1991-2020). 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”.

We used rain gauges we had constructed, an electronic one, volumetric containers and timers in order to take measurements of rain height and surface runoff in the 17th of April 2022.

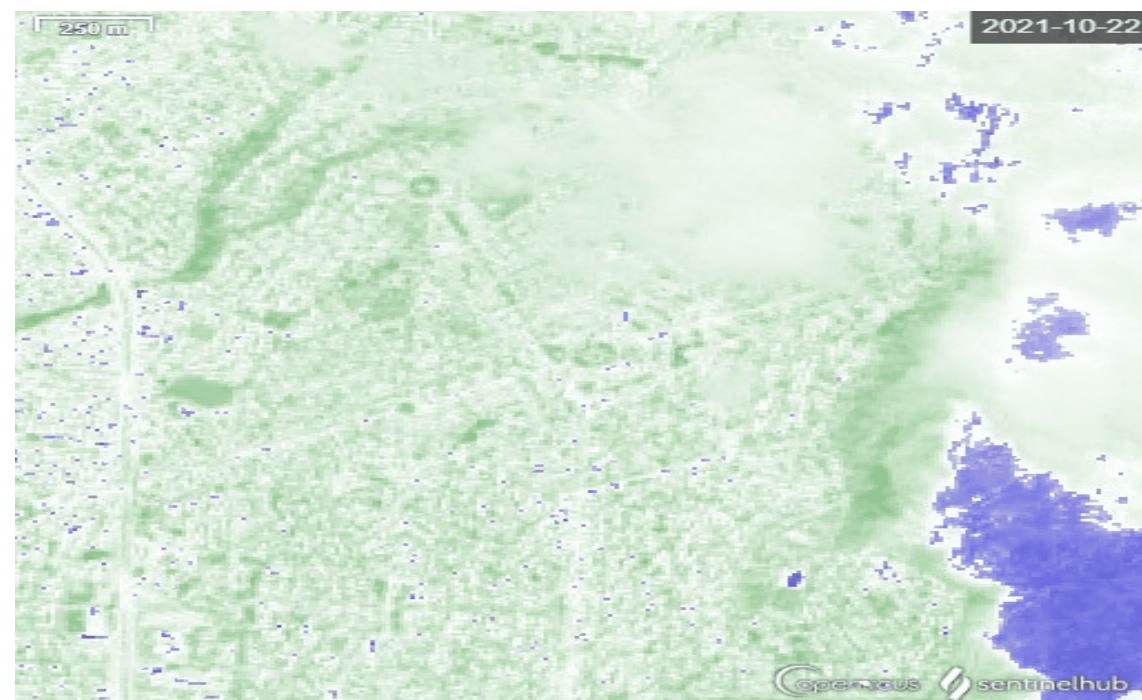


Figure 1: Timelapse of Ilioupoli mapping the areas of water body collection during rainy days

MAIN RESULTS

Studying the data from the Technical Service of the Municipality of Ilioupoli and local media, we found out that the entire length of the Trahonon stream that crosses Ilioupoli has coated, many blocks of flats have built in the historic riverbed of Pikrodafni stream and its natural slopes and vegetation have destructed, which increases the momentum and the amount of water, hence the flood risk.

We did an autopsy in the Pikrodafni stream and took pictures of the boxed and the grounded parts of the stream.

Processing the data from the Hellenic National Meteorological Service (H.N.M.S), for the meteorological station in “Hellinikon”, an area very close to Ilioupoli, and for a thirty years period (1991-2020) we come to 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 (diagram 1).

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 (diagram 2).

III. The 10 bigger values of the maximum daily precipitation height for the period 1991-2012 are depicted in diagram 3. Most of them exceed the mean monthly precipitation height!

IV. In October the 14th 2021, the maximum daily precipitation height for the whole year in Ilioupoli was recorded (94mm!) while the precipitation height for the October 2021 was 128.2 mm, which deviates by 298% from the normal values of the period 1991-2020.

Analyzing data from the meteorological station of Ilioupoli, which is in operation since August 2020, 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 (14th October), indicating the consequences of climate change in our town!

Our in-situ experiments took place a day with low rain intensity (4/17/2022), so the improvised rain gauges proved to be of little accuracy compared to the electronic one. For the same reason, only 2 out of the 7 stations, we had set up, managed to collect surface runoff water and took laboratory measurements.

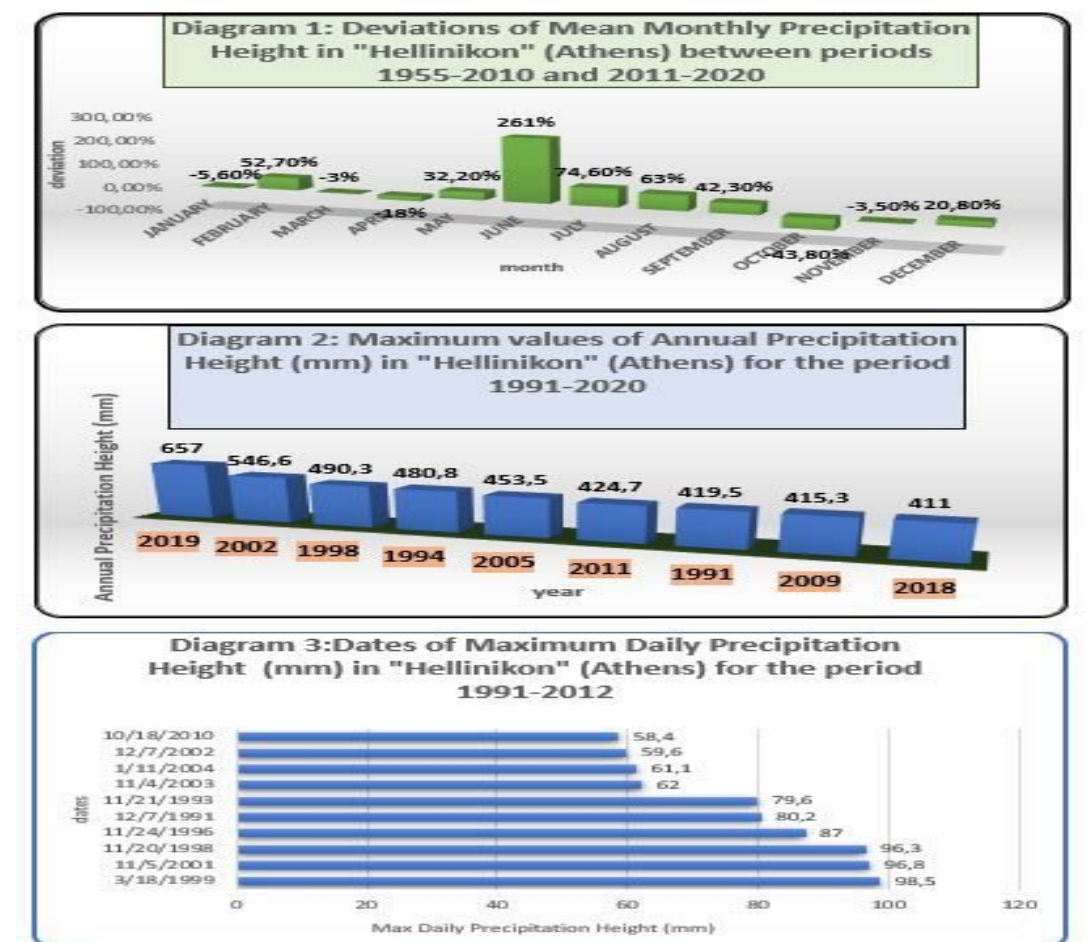


Figure 2: Graphic representation of processing data from Hellenic National Meteorological Service

ACTIONS TO HELP LESSEN TO THE PROBLEM



Figure 3: Posters of sustainable development and flood instructions- Trash art- Reforestation

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.
2. For the recycling goals, we made art from trash.
3. Drew a poster with flood instructions.
4. We created an on-line knowledge game about floods.
5. We participated to the voluntary reforestation of Ymittos, organized by the Municipality of Ilioupoli (3rd of April 2022).
6. Our team is going to participate 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.
7. We will organize a day-event at our school in May 2022 for students, teachers, parents, members of the local Council and present the results of our research.
8. We shall present to our mayor a written proposal: a) Teachers training by experts agronomists how to plant trees in the burnt areas of Ymittos, 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.