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Determining the Opinions of Pupils on Space Professions: A Local Case Study (Greece)

Evangelos C. Papakitsos[1], Anastasios Mavrakis[2,3], Konstantinos Karakiozis[4] & Xenophon Vamvakeros[5]

[1] Centre for Counselling & Vocational Guidance of Elefsina, Elefsina, Greece

[2] Environmental Education Office, Secondary Education Directorate of Western Attica, Elefsina, Greece

[3] Institute of Urban Environment and Human Resources, Department of Economic and Regional Development, Panteion University of Social & Political Sciences, Athens, Greece

[4] Youth Counselling Station of Western Attica, Elefsina, Greece

[5] Director, Secondary Education Directorate of Western Attica, Elefsina, Greece

Correspondence: Anastasios Mavrakis, Secondary Education Directorate of Western Attica, Dragoumi 24, GR-19200 Elefsina, Greece. Tel: 30-210-554-5391.

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Abstract

The purpose of this study was to plan educational interventions for informing the school population of Western Attica (Greece), an area with acute social and environmental problems (unemployment and natural disasters), about Space professions and their career perspectives. Accordingly, a questionnaire for determining the opinions of senior high-school pupils on the related issues had been designed and used for conducting a limited preliminary survey, to evaluate the entire process. This survey indicated that pupils are not aware of the related career prospects. The recording of the opinions about Space professions revealed that they are strongly associated with the profession of astronaut, although there are many more that can contribute to social welfare and environmental protection. Therefore, an educational intervention should be planned around three main points; these of presenting: Space professions, available career options and motives for pursuing them.

Keywords: Space professions, secondary education, environmental observation

1. Introduction

NASA is planning to send a crew to Mars in the 2030s (Note 1). For meeting such ambitious future goals, USA will need the next generation of scientists, engineers and Space professionals. Consequently, thousands of nowadays' pupils should follow relevant career paths for creating the necessary workforce in future. A prerequisite for this endeavor from an educational perspective is the interest of pupils in Science, Technology, Engineering and Mathematics (STEM) learning. For recording the present situation in USA's education, Lockheed Martin Space Systems commissioned a national survey (conducted by Morar Consulting in 2017), addressing 1,000 middle and high school teachers (Note 1). According to this survey, only one third of the teachers detected some interest about STEM that would lead their pupils to Space professions. Nevertheless, a much larger percentage of them reported that there are activities for potentially increasing pupils' focus on STEM, including discussions about Space-related careers or a "near-term return to the moon" (Note 1). In this respect, Lockheed Martin Space Systems implements the Generation Beyond program that includes (Note 1):

- a Space-themed curriculum that "connects students to the real-world exhilaration of space exploration";
- a new application that simulates what is like to explore the surface of Mars;
- the Generation Beyond Video Challenge Contest (in 2017).

Regarding the latter, pupils (individually or as a group) submitted design concepts for the living quarters of the spacecraft that will take the first people to Mars. The first-place prizes of the contest were $10,000, a tour to Kennedy Space Centre and a meeting with a panel of experts in Space exploration (Note 1). It is also interesting to mention that NASA conducted (in 2017) to the floor of the Atlantic Ocean, with an international crew, the Extreme Environment Mission Operations (NEEMO) 22 project, concerning "exploration spacewalks and objectives related to the International Space Station and deep space missions" (Note 2).

On the other side of the Atlantic respectively, there are various institutions of the European Union (EU) that are

involved directly with Space technologies and activities, thus indirectly with Space professions. These institutions notably include:

- The European Space Agency (ESA) (Note 3), having its headquarters in Paris (France) and its major spaceport in French Guiana (Guiana Space Centre); other facilities are located in Germany, England, Italy, Spain, Belgium and Netherlands (Note 4); ESA provides many educational programmes for educators (Note 5) and relevant applications for children (Note 6).
- The Space Tech Expo – Europe exhibition (there is also Space Tech Expo – USA), associated with the free-to-attend Industry and Technology Forum, which brings together "professionals in the Space industry in Europe and beyond to discuss current trends, developments and challenges in the market, as well as innovative and ground-breaking technologies" (Note 7).
- The Horizon 2020 (H2020) initiative of EU that is funding many Space-related projects (Note 8) and proposals (Note 9).
- EUROAVIA, which is the European Association of Aerospace Students of tertiary education, comprising 42 local groups in 18 countries and more than 2000 members (Note 10).

Greece actively participates in all the above institutions (Note 11), with a major partner being the Hellenic Aerospace Industry (Note 12). Although there is a website dedicated to Space professions (Note 13) and another one for relevant training courses (Note 14), neither the Hellenic STEM-education society (Note 15) nor the career-perspective surveys mention Space professions directly; they do record though many professions requiring STEM learning (Vlachaki et al., 2013, pp. 8-33). Moreover, there have been no surveys detected, regarding the opinions of senior secondary education pupils about Space professions. Therefore, the initial activity of this study was to design a questionnaire for recording the opinions of senior high-school pupils on the related issues and to conduct locally (Western Attica, Greece) a limited preliminary survey for evaluating the entire process. The final goal is the planning of interventions, within the frameworks of Educational/Career Counselling, Vocational and Environmental Education, that will clarify the characteristics of Space professions and will highlight their career perspectives, in an area (Western Attica) with acute social and environmental problems (Karakiozis et al., 2015; Mavrakis et al., 2015; Papakitsos et al., 2017; Salvati & Mavrakis, 2014).

2. Context

The pupils of senior secondary education have been selected as a target group, because they are at this educational stage where they make decisions for career paths. This is particularly important for the pupils of the 1st grade (15-16 years old), because in the Greek educational system they will have to decide which specific study-directions to choose in the 2nd grade, including Science, Technology, Arts, Humanities, etc., both in Senior General and Vocational High-Schools. Consequently regarding Space professions, this is the proper time to have their features determined and clarified. The most emblematic Space profession is that of astronaut (transliterated from Greek, literally meaning "star-sailor").

2.1 The Astronaut

During the 1960s in USA, the definition of the astronaut was formulated after the launch of the first spacecraft with a crew of testing pilots (Note 16). According to the American standards, the astronaut is an aviator that flies more than 80 kilometers above Earth (in Russia they have been named "cosmonauts", while in China "Yǔ háng yuán" or "Hángtiān yuán"; see: Note 17). They are called pilots or scientists, depending on the training, knowledge and duties that they undertake in a mission. The pilot-astronauts are either commanders or not:

- The commander is responsible for the spacecraft, the crew, the success of the mission and the safety of the flight.
- The pilot assists the commander in controlling, activating and running the spacecrafts.

Special-mission astronauts cooperate with the commander and the pilot, by having the overall responsibility for the spacecraft's operations in tasks such as: the planning of crew activity, the usage of consumables, etc. They are trained in the details of the operating systems, as well as the experiments carried out on their missions. They also perform the external activities or Space walks. Usually, the crew of Space missions also includes scientists in special duties, who are responsible for conducting and monitoring experiments in Space (Note 16).

Every Space mission has been planned for many years. The astronauts constantly carry out drills for acquiring the ability to successfully execute their mission, through the simulation of Space flights in conditions without gravity (Note 2). The equipment that they use is the spacecraft and the various instruments located inside the spacecraft's flight deck, such as: wireless communication devices, data display screens, radar and more. The astronauts wear

special equipment, oxygen masks and special flight uniforms (Note 16).

Although being the most characteristic and well-known Space profession, the astronaut is also the rarest one. By November 17, 2016, just a total of 552 persons from 36 countries had ever become astronauts (Note 17). After every recruitment call, ESA accepts only 15 candidates out of 20,000 applicants (Note 16). Yet, there are more Space-related professions available, in a variety of topics and activities that should be mentioned herein.

2.2 More about Space Professions

There are just a couple of aspects that Space activities could be classified in. One such aspect is the purpose that can be scientific (curiosity), commercial or military. Another one is the topic that can be roughly distinguished in:

- observation of outer Space (> 100 km from the surface of Earth) (Mooley et al., 2018);
- observation of Earth (Note 14) for weather forecasting (Note 18) or climatic phenomena (Note 19; Mavrakis & Tsiros, 2018) and other geological phenomena (Note 20);
- telecommunications (Note 21);
- transportations that include the deployment of Global Positioning Systems (GPS) (Note 22), transport of materials and persons around Earth or in outer Space and even Space tourism (Note 23);
- research and applications on building the required infrastructure for the previous activities, including observatories, ground stations on Earth or other planets (e.g., Mars), launching rockets, spacecrafts, Space stations, satellites, Space-museums and planetariums.

In this vocational context, the Space-related professions (besides the astronaut) are classified in three categories (Note 24):

- Scientists (meteorologists, astrophysicists, earth observation scientists, plasma physicists, astrogeologists, project scientists, Space-weather scientists, mathematicians, astrobiologists, archaeoastronomers and astrochemists);
- Engineers (mechanical engineers, software engineers, ground segment engineers, electrical engineers, propulsion engineers, aerospace engineers, chemical engineers, product assurance & safety engineers, spacecraft systems engineers and materials engineers);
- and others (nutritionists, Space educators, graphic designers, project managers, medical doctors, astronaut-costume designers, Space writers, acoustic technicians, Space lawyers, Space psychologists, astrophotographers and science historians).

These professionals are hired by the Space employers (Note 24), who are national Space agencies, companies in the Space industry, universities, research centres and museums. This vocational context has been used to design a questionnaire for conducting a preliminary survey on Space professions, aiming at pupils of senior secondary education in the area of Western Attica (Greece).

3. Method & Results

As mentioned previously, in the Greek educational system, the pupils of senior high-school have to make crucial decisions, by the end of the 1st grade, indirectly on career paths, through the choice of study-directions available from the 2nd grade onwards (Arts, Science, Engineering, Technology, Economics, Humanities, etc.). Thus, it was decided by the research team of educational experts (on Educational/Career Counselling and Environmental Education) at the local Secondary Education Directorate of Western Attica (WASED) to conduct a descriptive research by designing a relevant questionnaire (Appendix A), addressed to pupils of the 1st grade of senior high-school, for recording their opinions on Space professions. The usefulness of such an intervention will be discussed in the next section.

In order to evaluate the precision of the questionnaire and possibly correct any observed deficiencies in its design, it was preliminary handed out to 100 pupils, attending the 1st grade of a senior high-school in an urban area, who were selected by random sampling. This number of pupils (100) corresponds approximately to 6% of the total school population that attends the 1st grade of senior high-schools in Western Attica. The sample was informed about the questionnaire and the completion process. The completion of the questionnaire was voluntary, in order to reveal the real intentions of pupils in the issue under consideration. The responses were quite disappointing for some of the authors, although expected and normal by others. Only four pupils responded directly, by filling in the questionnaire. The rest of them (96) responded indirectly, by stating to their teachers that it is pointless to do so, considering impossible for them to become astronauts, even if they were interested in this profession, since there is no such professional field in their country. The responding through the questionnaire pupils were actually all

girls, perhaps because according to the relevant bibliography (Jones & Myhill, 2004; Skiba et al., 2002; Wallace et al., 2008), teen girls comply with and discipline in school rules more than teen boys. Moreover, girls of this age feel more satisfaction at school and educational process than boys (Katja et al., 2002; Wang et al., 2011).

A summary of the most important opinions of those four girls is presented below (Table 1), referring to the related questions (Appendix A) by their number (Nr.) and excluding the demographic ones (Nr. 1-4):

- Although all of the girls are interested in the exploration of Space (Nr. 5), they are not particularly interested in following a relevant career (Nr. 9: 3 values < 4), because they don't actually believe that they have such professional prospects in Greece (Nr. 11: 4 values < 3).
- Only two of them are curious about the profession of astronaut and are aware of the variety of Space professions (Nr. 6, 7), yet only one feels capable of pursuing a relevant career (Nr. 10: 1 value = 4) and knows about the existence of the Greek Space Organization (Nr. 15h), which is very recent though (Note 25).
- Finally, three of the girls don't generally think that the subjects/courses of Biology (Nr. 8d) and Geology-Geography (Nr. 8e) are related to aerospace professions, compared to the rest of them.

Table 1. Significant responses to selected questions (Appendix A)

Nr.	Question	Values: 1(Low)-5(High)	Yes/No
5	Are you interested in the exploration of Space?	100% > 2	
6	Have you ever considered any of the following issues: qualifications/training/salary of an astronaut?	50% > 3	
7	Which of the following activities do you believe that are related to Space Professions: Exploration of Space, satellite/aircraft technologies?	50% > 3	
8d/e	What kind of knowledge do you believe that is required for someone who is or wants to be involved in Aerospace Professions: Biology/ Geology-Geography?	75% < 4	
9	Would you be interested in getting involved in Aerospace Professions?	75% < 4	
10	Regardless of your answer to the previous question, how competent do you feel to deal with Aerospace Professions?	25% > 3	
11	Do you believe that there is a potential and prospects to engage in Aerospace Professions in Greece?	100% < 3	
15h	Do you know about the Space Agencies of the following countries: Greece?		Yes (25%)

Although statistically insignificant, the previous opinions are important, not in a quantitative but in a qualitative manner. After all, the purpose of Educational/Career Counselling is to find the right person for the right job, while the educational system should facilitate this process.

4. Discussion & Conclusion

From the previous statements (96) and direct responses (4) there are two conclusions resulted:

[i] Most of the pupils (i.e., 98% of the participants) directly (2%) or indirectly (96%) identify Space professions exclusively with astronauts.

[ii] Almost all of the pupils (i.e., 99% of the participants) are not aware of the national Space organizations (Greece), their activities and the corresponding professional perspectives.

These results [i-ii] have been taken into account for formulating an educational proposal, presented below, which will include the necessary information about Space professions and their valuable contribution to the local welfare.

Consequently, an educational intervention that aims at informing the school population about Space professions should be planned around three main points, considering the previous results [i-ii], in a reasonable sequence. The first one is to clarify the misunderstanding that Space professions are practically not about becoming an astronaut [i]; there are many more and almost all of them require a strong knowledge-background of STEM education (see subsection: *2.2 More about Space Professions*).

The second main point is a reasonable follow up of the first one. It presents the available options for pupils about pursuing a career path that leads to the previously described Space professions. In this respect, pupils should become aware of their national Space agencies and the local institutions [ii] that will allow them to be involved

and distinguished in this vocational sector. For example, in Greece there is:

- A national Space agency (announced on March 20, 2018), aiming at (Note 25): increasing the competitiveness, dynamism and extroversion of the Greek economy; the diffusion of Space technologies and applications to all sectors of the economy (telecommunications, agriculture, transportations, education, etc.); increasing the defense capabilities of the country (satellite communications, radio navigation, Earth observation, etc.); strengthening the position of Greece through the development of collaborations with technologically developed countries.
- An association of Space industries (HASI), comprising high-tech companies with over 1,000 employees, that may include: "Enterprises, involved in the subject field, Academic institutions and research centres, Service Providers, Science Parks, Networks and Associations, DMO knowledge transfer, Commercial or investment banks, Business angels, Strategic Investors, National and regional authorities" (Note 26).
- A school contest ("CanSat"), addressed to high-school pupils, which familiarizes them with technologies similar to those used in a satellite; the national competition is a qualifying phase of the European one ("CanSats in Europe"), organized by ESA (Note 27).

In addition, Greece participates in international Space organizations (e.g., ESA) and projects for various purposes, including for example the protection of seas (Note 28) and "Clean Sky 2" (Note 29). A career path along these lines can be very promising for the talented and/or committed pupils, especially in Western Attica, which is an area with increased rates of unemployment that exceeds 25% of the labour force (Karakiozis & Papakitsos, 2018). This issue is more of a qualitative than quantitative nature. The aim of an educational intervention should be to discover those few talented or interested pupils, inform them about the relevant prospects and assist them to pursue such a vocational goal.

Once again, the third main point is a reasonable follow up of the second one. It regards the discovery of proper motives that would be locally important for pupils. In particular, besides the previously mentioned unemployment, Western Attica is an environmentally endangered area that has been struck by a lethal natural disaster in the near past (Appendix B). Consequently, there are activities that concern the observation of areas and natural phenomena, both nationally (Appendix C) and locally that monitor floods (Appendix D) and forest-fires (Appendix E), thus contributing to the elaboration of plans for the prevention of damages and the protection of local population and environment.

Therefore, the educational activities that inform the school population about Space professions could be proved very useful, not only for pupils and their careers but also for the welfare of the local communities, in long-term.

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References

Jones, S., & Myhill, D. (2004). 'Troublesome boys' and 'compliant girls': gender identity and perceptions of achievement and underachievement. *British Journal of Sociology of Education*, *25*(5), 547-561. https://doi.org/10.1080/0142569042000252044

Karakiozis, K., & Papakitsos, E. C. (2018). Attitudes of Teachers Who Implement School Mediation Programmes: A Case Study. *International Educational Research*, *1*(2), 16-25. https://doi.org/10.30560/ier.v1n2p16

Karakiozis, K., Papapanousi, C., Mavrakis, A., & Papakitsos, E. C. (2015). Initiating an Olweus-Based Intervention Against School-Bullying. *Journal of Social Sciences and Humanities*, *1*(3), 173-179.

Katja, R., Päivi, Å. K., Marja-Terttu, T., & Pekka, L. (2002). Relationships Among Adolescent Subjective Well-Being, Health Behavior, and School Satisfaction. *Journal of School Health*, *72*(6), 243-249. https://doi.org/10.1111/j.1746-1561.2002.tb07337.x

Lekkas, E., Diakakis, M., Andreadakis, E., Spyrou, N. I., Gogou, M., Katsetsiadou, N. K., Speis, P., Georgakopoulos, A., Nikolopoulos, E., & Deligiannakis, G. (2017). Flash Flood in West Attica (Mandra, Nea Peramos) November 15, 2017. *Newsletter of Environmental, Disaster and Crisis Management Strategies*, *5*, 1-73. Available online: https://edcm.edu.gr/images/docs/2017/Newsletter_Attica_floods_2017.pdf (accessed on 23 October 2018; in Greek).

Mavrakis, A. F., & Tsiros, I. X. (2018). The abrupt increase in the Aegean Sea surface temperature during the June 2007 southeast Mediterranean heatwave – A marine heatwave event? *Weather, 99*(99), 1-6.

https://doi.org/10.1002/wea.3296

Mavrakis, A., Papavasileiou, C., & Salvati, L. (2015). Towards (Un)sustainable Urban Growth? Climate aridity, land-use changes and local communities in the industrial area of Thriasio plain. *Journal of Arid Environments*, *121*, 1-6. https://doi.org/10.1016/j.jaridenv.2015.05.003

Mooley, K. P., Deller, A. T., Gottlieb, O., Nakar, E., Hallinan, G., Bourke, S., Frail, D. A., Horesh, A., Corsi, A., & Hotokezaka, K. (2018). Superluminal motion of a relativistic jet in the neutron-star merger GW170817. *Nature*, *561*(Letter), 355-359.

Papakitsos, E. C., Karakiozis, K., & Foulidi, X. (2017). Systemic methodology for inclusive education policies in areas with acute social problems. *European Journal of Alternative Education Studies*, *2*(1), 32-47. https://doi.org/10.5281/zenodo.345186

Salvati, L., & Mavrakis, A. (2014). Narrative and Quantitative Analysis of Human Pressure, Land-use and Climate Aridity in a Transforming Industrial Basin in Greece. *International Journal of Environmental Research*, *8*(1), 115-122. https://doi.org/10.22059/ijer.2014.700

Skiba, R. J., Michael, R. S., Nardo, A. C., & Peterson, R. L. (2002). The Color of Discipline: Sources of Racial and Gender Disproportionality in School Punishment. *The Urban Review*, *34*(4), 317-342. https://doi.org/10.1023/A:1021320817372

Vlachaki, F., Sgouraki, R., Adamopoulou, A., & Katsimani, M. (2013). *Upcoming professional sectors in Greece and new required skills*. Nea Ionia Attikis, Greece: National Organisation for the Certification of Qualifications & Vocational Guidance (EOPPEP) (in Greek).

Wallace, Jr. J. M., Goodkind, S., Wallace, C. M., & Bachman, J. G. (2008). Racial, Ethnic, and Gender Differences in School Discipline among US High School Students: 1991-2005. *The Negro Educational Review*, *59*(1-2), 47.

Wang, M. T., Willett, J. B., & Eccles, J. S. (2011). The assessment of school engagement: Examining dimensionality and measurement invariance by gender and race/ethnicity. *Journal of School Psychology*, *49*(4), 465-480. https://doi.org/10.1016/j.jsp.2011.04.001

Notes

Note 1. Space Daily: Few Teachers Believe Pupils Interested In Subjects That Would Lead Them To Space Exploration Careers. Retrieved from http://www.spacedaily.com/reports/Few_Teachers_Believe_Pupils_Interested_In_Subjects_That_Would_Lead_Them_To_Space_Exploration_Careers_999.html

Note 2. Space Daily: NASA Prepares for Future Space Exploration with International Undersea Crew. Retrieved from http://www.spacedaily.com/reports/NASA_Prepares_for_Future_Space_Exploration_with_International_Undersea_Crew_999.html

Note 3. ESA: united Space in europe. Retrieved from http://www.esa.int/ESA

Note 4. ESA: united Space in europe: Establishments and Facilities. Retrieved from http://www.esa.int/About_Us/Welcome_to_ESA/Establishments_and_facilities

Note 5. ESA: Space for education. Retrieved from http://www.esa.int/Education

Note 6. ESA Kids. Retrieved from https://www.esa.int/esaKIDSen/

Note 7. For 2017 see: Space Tech Expo – Europe. Retrieved from http://www.spacetechexpo.eu/forums/audio-gallery-2017?utm_source=Space%20Tech%20Expo%20Europe%20&utm_medium=email&utm_campaign=1961348_BRE17-EM98-Exhibition-Forum%20Audio%20Download&dm_i=2GPD,161DW,7M9166,3MSD9,1

Note 8. H2020 Projects - summary. Retrieved from https://webgate.ec.europa.eu/dashboard/sense/app/e8a41234-20b4-4e7e-80ef-335dd9e6ae36/sheet/941d3afe-da24-4c2e-99eb-b7fcbd8529ee/state/analysis

Note 9. H2020 Proposals - summary. Retrieved from https://webgate.ec.europa.eu/dashboard/sense/app/e02e4fad-3333-421f-a12a-874ac2d9f0db/sheet/941d3afe-da24-4c2e-99eb-b7fcbd8529ee/state/analysis

Note 10. EUROAVIA: Home. Retrieved from https://euroavia.eu/

Note 11. Ministry of Digital Policy, Telecommunications and Information: Ministerial Decision 3095/2018. Determining the procedure for managing, submitting, evaluating, approving or declining proposals for participation in the ESA programmes (European Space Agency), processing issues of participation in projects, programmes and activities of ESA as well as allocating national resources. Hellenic Republic: Government Gazette, Issue B 915, 15 March 2018 (in Greek).

Note 12. Hellenic Aerospace Industry S.A.: Home. Retrieved from http://www.haicorp.com/en/

Note 13. SPACE awareness: Understand the opportunities in Space exploration and the career potential it offers. Retrieved from http://www.space-awareness.org/el/careers/ (in Greek/English).

Note 14. si-Cluster: Space Training Course for Young Scientists and Professionals on Earth Observation. Retrieved from http://www.si-cluster.gr/el/all-events-gr/136-si-cluster-space-course.html

Note 15. Hellenic Education Society of S.T.E.M. (E3STEM). Retrieved from http://e3stem.edu.gr/wordpress/?cat=4

Note 16. Edujob E-Mentoring: Astronaut. Retrieved from http://edujob.gr/node/22984 (in Greek).

Note 17. Wikipedia: Astronaut. Retrieved from https://en.wikipedia.org/wiki/Astronaut

Note 18. Ventusky: Weather Forecast Maps. Retrieved from https://www.ventusky.com/?p=37.9;24.7;5&l=temperature-2m

Note 19. European Environment Agency: Climate change and water — Warmer oceans, flooding and droughts. Retrieved from https://www.eea.europa.eu/signals/signals-2018-content-list/articles/climate-change-and-water-2014

Note 20. Science alert / Environment: Strange Lakes Are Speeding Up Arctic Permafrost Melt, And That's Really Bad News / by Jacinta Bowler. Retrieved from https://www.sciencealert.com/the-arctic-permafrost-is-melting-strange-thermokarst-lakes-climate-change-abrupt-melting?perpetual=yes&limitstart=1

Note 21. Space Daily: Governments Must Plan Today for Flexibility Tomorrow in Space. Retrieved from http://www.spacedaily.com/reports/Governments_Must_Plan_Today_for_Flexibility_Tomorrow_in_Space_999.html

Note 22. Wikipedia: Global Positioning System. Retrieved from https://en.wikipedia.org/wiki/Global_Positioning_System

Note 23. Space Daily: Fast-moving Space industries create new ethical challenges. Retrieved from http://www.spacedaily.com/reports/From_tourism_to_terrorists_fast_moving_space_industries_create_new_ethical_challenges_999.html

Note 24. SPACE awareness: SpaceCareers_SpaceAwareness_Booklet_red.pdf. Retrieved from http://www.space-awareness.org/en/careers/

Note 25. European Space Agency: ESA in your country > Greece. Retrieved from https://www.esa.int/ell/ESA_in_your_country/Greece/Ellenikhos_Organismhos_Diasthematos (in Greek).

Note 26. The Hellenic Association of Space Industry. Retrieved from http://www.hellenic-asi.org/en_index.php

Note 27. CanSat in Greece: Launching your Dreams. Retrieved from https://cansat.gr/ (in Greek).

Note 28. Copernicus > CleanSeaNet: Ten years protecting our seas. Retrieved from http://copernicus.eu/news/cleanseanet-ten-years-protecting-our-seas

Note 29. General Secretariat for Research & Technology > Greece in Programme Clean Sky 2: Signing the Memorandum of Understanding (MoU) between Greece and the Initiative “Clean Sky2-Joint Undertaking/CS2JU”. Retrieved from www.gsrt.gr/central.aspx?sId=124I430I1090I646I508702&olID=777&neID=589&neTa=2_91604&ncID=0&neHC=0&tbid=0&lrID=2&oldUIID=aI777I0I119I428I1089I0I3&actionID=load (in Greek).

Note 30. Wikipedia: Floods in Western Attica (2017). Retrieved from https://el.wikipedia.org/wiki/%CE%A0%CE%BB%CE%B7%CE%BC%CE%BC%CF%8D%CF%81%CE%B5%CF%82_%CF%83%CF%84%CE%B7_%CE%94%CF%85%CF%84%CE%B9%CE%BA%CE%AE_%CE%91%CF%84%CF%84%CE%B9%CE%BA%CE%AE_(2017) (in Greek).

Note 31. BEYOND: Thematic Areas > Disasters > Floods - Products overview. Retrieved from http://beyond-eocenter.eu/index.php/thematic-areas/disasters/floods-products-overview/65-chartografisi-tis-ektasis-tis-plimmiras-stin-mandra-magoula-26062018 (in Greek).

Note 32. NASA - FIRMS: Fire Information for Resource Management System. Retrieved from https://firms.modaps.eosdis.nasa.gov/map/#z:10;c:23.6,38.0;l:24hrs

Appendix A

The Questionnaire

The questionnaire consists of 15 questions (the equivalent responding options/scale-values is enclosed in curly brackets), as follows:

1. Sex {Male / Female}.
2. Grade {1st / 2nd / 3rd}.
3. Type of school {General / Vocational}; Area {open question for city}.
4. Educational level of parents {Primary / Junior Secondary / Senior Secondary / Post-secondary / Tertiary (first) / Post-graduate / Doctoral}: Separately for Father / Mother.
5. Are you interested in the exploration of Space {1=Low – 5=High}?
6. Have you ever considered any of the following issues {1=Low – 5=High}:
    a. What are the qualifications for becoming an astronaut?
    b. What is the training of an astronaut?
    c. What is the salary of an astronaut?
7. Which of the following activities do you believe that are related to Space Professions {1=Low – 5=High}?
    a. Exploration of Space (manned or not spacecrafts, Space buses or stations);
    b. Satellite technologies (telecommunications, radio-beacons/GPS, observation of Space or Earth);
    c. Aircraft technologies (manned or not: airplanes, helicopters, airships, air-balloons; drones).
8. What kind of knowledge do you believe that is required for someone who is or wants to be involved in Aerospace Professions? (Rate your answer for each one of the following) {1=Low – 5=High}:
    a. Mathematics;
    b. Physics (including Astrophysics and Meteorology);
    c. Chemistry (including Materials Science);
    d. Biology;
    e. Geology and Geography;
    f. Mechanical Engineering (including Aeronautics);
    g. Electrical Engineering;
    h. Electronics Engineering (including Telecommunications);
    i. Informatics / Computer Science.
9. Would you be interested in getting involved in Aerospace Professions {1=Low – 5=High}?
10. Regardless of your answer to the previous question, how competent do you feel to deal with Aerospace Professions {1=Low – 5=High}?
11. Do you believe that there is a potential and prospects to engage in Aerospace Professions in Greece {1=Low – 5=High}?
12. Do you know the difference between military and commercial Space applications {1=Low – 5=High}?
13. Are you aware of the problems arising from the use of Near Space for military and commercial applications {1=Low – 5=High}?
14. What do you know about the profession of Astronaut? (Rate your answer for each one of the following) {1=Low – 5=High}:
    a. General description;
    b. Working conditions;

c. Required skills and features;
d. Required training;
e. Professional Rights;
f. Professional prospects.

15. Do you know about the Space Agencies of the following countries? (Give your answer for each one of the following) {Yes / No}:
    a. USA;
    b. Russia;
    c. UK;
    d. France;
    e. Germany;
    f. Japan;
    g. India;
    h. Greece;
    i. China.

Appendix B

Natural Disaster in Western Attica

On November 15, 2017, there was a flash flood after a heavy rainfall in Western Attica, mainly affecting the towns of Mandra, Elefsina and Nea Peramos (Lekkas et al., 2017), causing serious damages and the death of 23 persons (Note 30).

Appendix C

Observation of the Aegean Sea

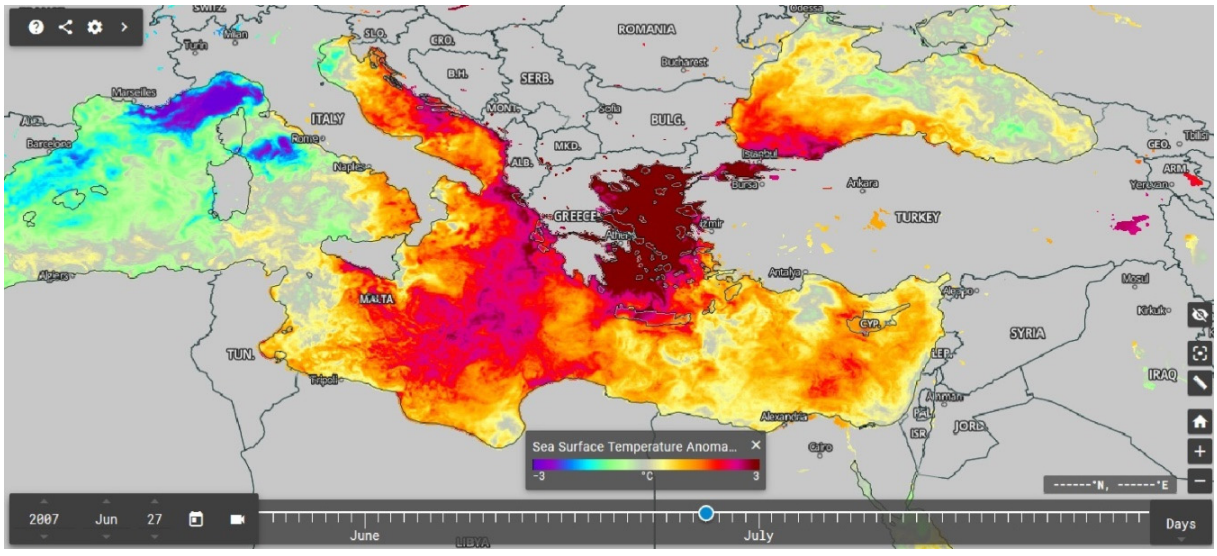

Figure C1. The surface temperature of the Aegean Sea during June 2007 (Mavrakis & Tsiros, 2018)

Appendix D

Observation of the Town of Mandra

For example (Figure D1), the FloodHub team of the BEYOND Remote Sensing Center for Natural Disasters (http://beyond-eocenter.eu/) of the Astronomy, Astrophysics, Space Applications and Remote Sensing Institute of the National Observatory of Athens (Greece) had been activated immediately after a flood in Western Attica (June 26, 2018) and mapped the affected area (534 hectares), by using remote sensing, photo interpretation, crowdsourcing data and autopsies.

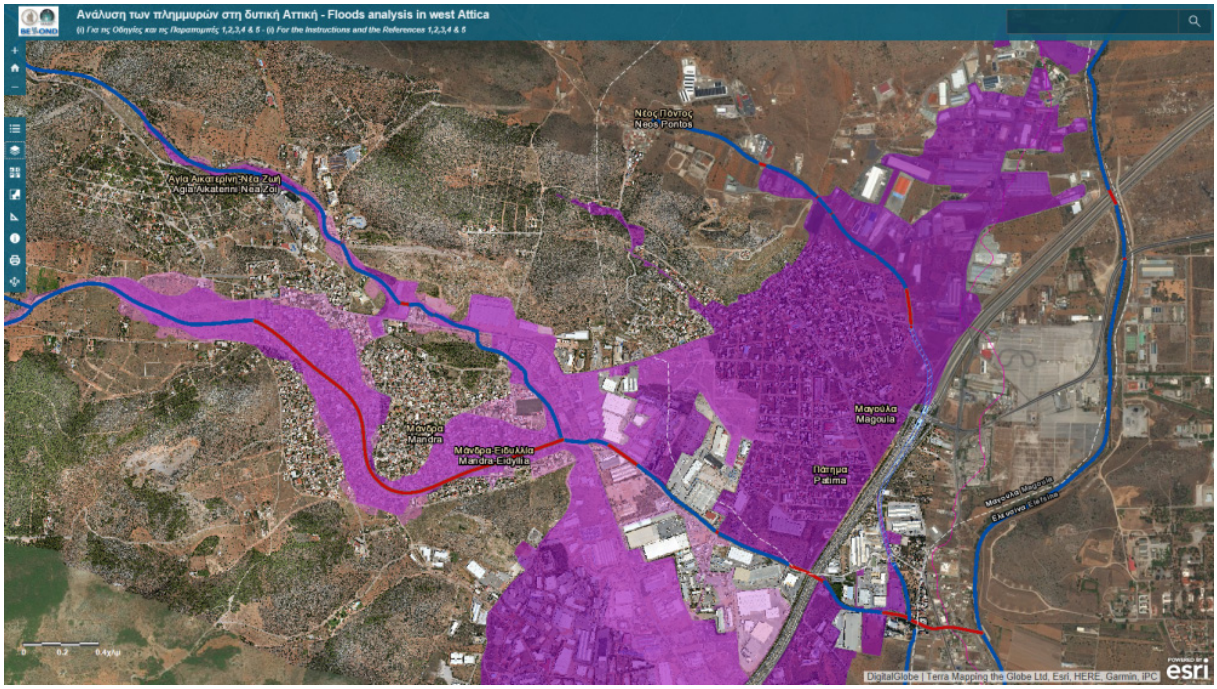

Figure D1. A flood-affected area in Western Attica (town of Mandra), marked purple (Note 31)

Appendix E

Observation of Western Attica

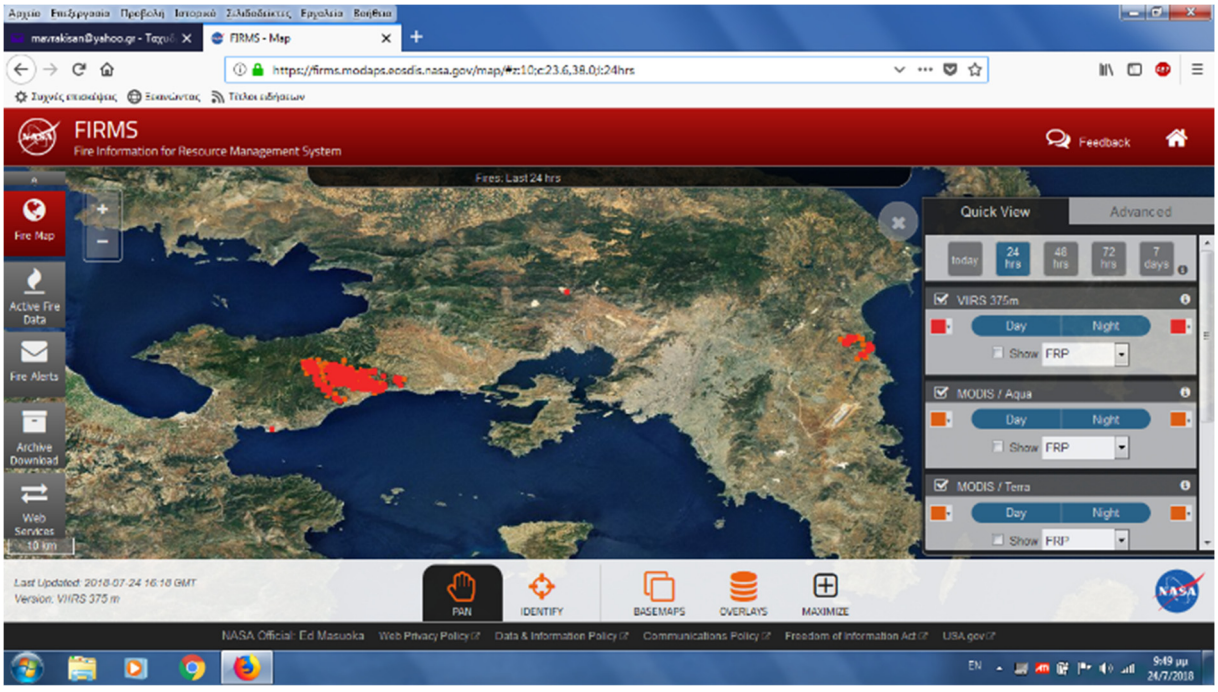

Figure E1. Image of a forest-fire in Western Attica (2018-07-23), marked red on the left of the map (Note 32)