Electronic Supplementary Material

Environmental impact of Aposelemis dam and tunnel water supply project, in NE Crete, Greece

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Questionnaires’ Format, in English
# ENVIRONMENTAL DESIGN

## Questionnaire for the investigation of observed environmental impacts due to Aposelemis project

### Lasithi Plateau area

### ATTITUDE - KNOWLEDGE

1. What is your relation to Lasithi Plateau area?
   - Residence □
   - Agricultural activities □
   - Origin & visit □
   - Other □

2. In which village of the Lasithi Plateau is your residence / activity?
   - K.Metochi □
   - Ag.Charalampos □
   - Platia □
   - Psychro □
   - Magoulas □
   - Kaminaki □
   - Avakontes □
   - Ag. Georgios □
   - Ag.Constantinos □
   - Mesa Lasithi □
   - Marmaketo □
   - Tzermiado □
   - Lagou □
   - Pinakiano □
   - Other: □

3. How long do you live / are you active in the area?
   - > 20 years □
   - 20-10 years □
   - 10-5 years □
   - <5 years □

4. Are you familiar with Aposelemis project?
   - Yes □
   - No □

### PAST OPINION

5. Which was your attitude/opinion before Aposelemis project’s implementation?
   - I had objections □
   - I was not interested □
   - I was indifferent □
   - I was in favour of the project □
   - Other, please explain to us: □

6. In your opinion, did the local community participate (through representatives) in project’s design?
   - No □
   - A little □
   - Medium □
   - Much □
   - Very much □
   - I don’t know □

7. In your opinion, was the expropriation compensation of Potamies-Sfendylí-Avdo-Gonies satisfactory?
   - No □
   - A little □
   - Medium □
   - Much □
   - Very much □
   - I don’t know □

8. What is your opinion of Sfendylí residents’ resettlement?
   - A significant problem □
   - Unsatisfactory management □
   - Unsatisfactory compensation □
   - Unfair, discriminatory □
   - Satisfactory management □
   - Satisfactory compensation □
   - Fair, with some exceptions □
   - Correct management □
   - Correct compensation □
   - Without disproportion □
   - Difficult but necessary □
   - Few residents, thus a small problem □
   - Other □

9. Have you worked at the project during (or after) the construction period?
   - No □
   - Yes □
   - If yes, in what kind of work?

### TODAY OPINION

10. How do you evaluate the total Aposelemis project today?
    - I like it □
    - It doesn’t interest me □
    - I don’t like it □
    - It disturbs me □
    - Other □

11. Has your everyday life changed since the project’s construction and operation?
    - No □
    - A little □
    - Medium □
    - Much □
    - Very much □
    - Comments: □

12. If yes, your everyday life has changed...
    - Positively □
    - Neutral □
    - Negatively □

13. How do you evaluate the new landscape?
    - Better □
    - Indifferent □
    - Worse □

14. In your opinion, the quality of reservoir’s water is...
    - Very good □
    - Good □
    - Medium □
    - Poor □
    - Very poor □
    - If poor, please tell us why:

15. Do you consider the Aposelemis project successful?
    - No □
    - A little □
    - Medium □
    - Much □
    - Very much □
    - Comments: □

16. In your opinion, are there any impacts due to the project on your everyday life?
    - Yes □
    - Yes, economical □
    - Yes, social □
    - Yes, environmental □
    - Yes, in health □
    - Please, explain to us: □
    - I disagree □
    - It doesn’t interest me □
    - I agree □
    - I agree, provided a low price in my energy cost □

### ENVIRONMENTAL OBSERVATION

17. During the agricultural period 2019 (after the tunnel’s first operation in winter 2019):
    - (a) Have you observed any groundwater alterations in wells (than before)?
      - □ No difference.
      - □ Lower water level and water quantity than before.
      - □ Diminished pumping duration. It dried up earlier than before.
      - □ Other. Please, explain to us:
    - (b) In your opinion, was there sufficient water for irrigation purposes?
      - Yes □
      - No □
    - (c) In your opinion, do the new artificial reservoirs cover sufficiently area’s irrigation needs?
      - No □
      - A little □
      - Medium □
      - Much □
      - Very much □
      - Comments:
    - (d) In your opinion, does the tunnel’s operation affect Plateau’s agricultural activities?
      - No □
      - A little □
      - Medium □
      - Much □
      - Very much □
      - If yes, please explain to us:

18. Did you observe improved flood water drainage (due to the tunnel’s operation) than before?
    - Yes □
    - No □
    - No difference □
    - Comments:

19. In your opinion, the quality of the groundwater of the area is...
    - Very good □
    - Good □
    - Medium □
    - Poor □
    - Very poor □
    - If poor, please tell us why:

20. In your opinion, the quality of the surface water of the area is...
    - Very good □
    - Good □
    - Medium □
    - Poor □
    - Very poor □
    - If poor, please tell us why:

21. Since the tunnel’s operation (2019-2020), have you observed any flow alteration in springs of the area (i.e. Kastamonitsa springs, Gonies springs)?
    - Yes □
    - No □
    - I don’t know □
    - If Yes, please explain to us:

22. Have you observed any environmental alterations due to the project, concerning...
    - Animals, birds & insects □
    - Plants & trees □
    - The ground □
    - The water □
    - Other □
    - Please explain to us:

23. In your opinion, has the landscape of former construction sites been restored?
    - Yes □
    - Partly □
    - No □
    - Comments:

24. How do you consider the areas of excavation materials deposition?
    - They disturb me □
    - They don’t disturb me □
    - Comments:

### OPINION FOR THE FUTURE

25. Are you interested in the hypothetical scenario of controlled leisure activities organization at the lakeside area (i.e. catering infrastructures, hiking activities, nature observation etc)?
    - Yes □
    - No □

26. What is your opinion on the hypothetical scenario of project’s use for energy production?
    - I disagree □
    - It doesn’t interest me □
    - I agree □
    - I agree, provided a low price in my energy cost □

### PERSONAL CHARACTERISTICS

27. Gender □
    - Male □
    - Female □

28. Age group □
    - < 18 □
    - 18-24 □
    - 25-39 □
    - 40-54 □
    - 55-64 □
    - > 65 □

29. Marital status □
    - Married □
    - Not married □
    - Divorced □
    - Widower □

30. Educational level □
    - Elementary school □
    - High school □
    - Technical studies □
    - University studies □
    - Postgraduate studies □

31. Profession/Occupation □
    - In the public sector □
    - In the private sector □
    - Freelancer □
    - Farmer □
    - Housekeeping □
    - Pensioner □
    - Unemployed □
    - Student □

32. Residence □

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### ENVIRONMENTAL DESIGN

**Questionnaire for the investigation of observed environmental impacts due to Apoelimes project**

**Aposeleis dam region**

#### ATTITUDE - KNOWLEDGE

1. I live / I activate in the area of Potamies – Avdou – Giony ...  
   - Permanently □  
   - Occasionally □  
   - Only in the summer period □  
   - Other □

2. How long do you live / are you active in the area?  
   - > 40 years □  
   - 20-40 years □  
   - 10-20 years □  
   - 5-10 years □  
   - <5 years □

3. Did you acquire any assets that were expropriated due to Apoelimes project implementation?  
   - No □  
   - Yes, land area □  
   - Yes, cultivated land □  
   - Yes, building □  
   - Other □

#### PAST OPINION

4. Did you have objection / hesitation / scepticism before the project’s implementation?  
   - No □  
   - A little □  
   - Medium □  
   - Much □  
   - Very much □  
   - If Yes, please tell us why...

5. In your opinion, did the local community participate (through representatives) in project’s design?  
   - No □  
   - A little □  
   - Medium □  
   - Much □  
   - Very much □  
   - Comments:

6. In your opinion, were the expropriation compensations satisfactory?  
   - No □  
   - A little □  
   - Medium □  
   - Much □  
   - Very much □  
   - Comments:

7. What is your opinion of Sfendyl residents’ resettlement?  
   - A significant problem □  
   - Unsatisfactory management □  
   - Unsatisfactory compensation □  
   - Unsatisfactory satisfaction compensation □  
   - Correct management □  
   - Difficult but necessary □  
   - Few residents, thus a small problem □

8. Have you worked at the project (or after) the construction period?  
   - No □  
   - Yes □  
   - If yes, in what kind of work?

#### TODAY OPINION

9. How do you evaluate the total Apoelimes project today?  
   - I like it □  
   - It doesn’t interest me □  
   - I don’t like it □  
   - It disturbs me □  
   - Other □

10. Has your everyday life changed since the project’s implementation?  
    - No □  
    - A little □  
    - Medium □  
    - Much □  
    - Very much □  
    - Comments:

11. If yes, your everyday life has changed...  
    - Positively □  
    - Neutral □  
    - Negatively □

12. How do you evaluate the new landscape?  
    - Better □  
    - Indifferent □  
    - Worse □

13. In your opinion, the quality of reservoir’s water is...  
    - Very good □  
    - Good □  
    - Medium □  
    - Poor □  
    - Very poor □  
    - If poor, please tell us why:

14. How do you feel living near the dam?  
    - I feel good □  
    - I do not care □  
    - I feel insecurity □  
    - Other □

15. During winter periods of 2019 & 2020, that the dam’s reservoir was filled with water...  
    - I was glad it was filled □  
    - I was uninterested □  
    - I felt insecurity □  
    - Other □

#### ENVIRONMENTAL OBSERVATION

16. Concerning the Emergency Plan (of controlled dam’s overflow) during winter periods of 2019 & 2020:  
   - (a) Were you satisfied at state management?  
     - No □  
     - A little □  
     - Medium □  
     - Much □  
     - Very much □  
     - Comments:

   - (b) Did you feel worry / anxiety / stress / fear during the cases of emergency?  
     - No □  
     - A little □  
     - Medium □  
     - Much □  
     - Very much □  
     - Comments:

17. Do you consider the Apoelimes project successful?  
    - No □  
    - A little □  
    - Medium □  
    - Much □  
    - Very much □  
    - Comments:

18. In your opinion, are there any impacts due to the project on your everyday life?  
    - No □  
    - Yes, economical □  
    - Yes, social □  
    - Yes, environmental □  
    - Yes, in health □  
    - Please, explain to us:

#### ENVIRONMENTAL DESIGN

19. Have you observed any environmental alterations due to the project, concerning...  
    - Animals & birds. Please, explain to us:  
      -□ Plants & trees. Please, explain to us:  
      -□ More insects. (Especially during summer time)  
      -□ Higher humidity levels  
      -□ Other:

20. Since the tunnel’s operation (2019-2020), have you observed any flow alteration in springs of the area (i.e. Kastamontisa springs, Giony springs)?  
    - Yes □  
    - No □  
    - I don’t know □  
    - If Yes, please explain to us:

21. Have you observed any groundwater alterations in wells, due to the project?  
    - No □  
    - Decreased volume □  
    - Lower water level □  
    - Completely dry well □  
    - Other □  
    - Please, explain to us:

22. In your opinion, has the landscape of former construction sites been restored?  
    - Yes □  
    - Partly □  
    - No □  
    - Comments:

23. How do you consider of the areas of excavation materials deposition?  
    - They disturb me □  
    - They don’t interest me □  
    - They don’t disturb me □  
    - I like them □  
    - Comments:

24. Which lakeside activities take place at the dam’s area?  
    - Hiking □  
    - Fishing □  
    - Livestock □  
    - Agriculture □  
    - Other / Comments:

#### OPINION FOR THE FUTURE

25. In your opinion, could the new lake upgrade certain cultural activities in the area (i.e. lakeside 1st running race organization in August 15, 2019)?  
    - Yes □  
    - No □  

26. Are you interested in the hypothetical scenario of controlled leisure activities organization at the lakeside area (i.e. catering infrastructures, hiking activities, nature observation etc)?  
    - Yes □  
    - No □  

27. What is your opinion on the hypothetical scenario of project’s use for energy production?  
    - I disagree □  
    - It doesn’t interest me □  
    - I agree □  
    - I agree, provided a low price in my energy cost □

#### PERSONAL CHARACTERISTICS

28. Gender: □ Male □ Female

29. Age group: □ < 18 □ 18-24 □ 25-39 □ 40-54 □ 55-64 □ > 65 □

30. Marital status: □ Married □ Not married □ Divorced □ Widowed □

31. Educational level: □ Elementary school □ High school □ Technical studies □ University studies □ Postgraduate studies □

32. Profession/Occupation: □ In the public sector □ In the private sector □ Freelancer □

33. Residence: □ Farmer □ Housekeeping □ Pensioner □ Unemployed □ Student □
Questionnaire for the investigation of observed environmental impacts due to Aposelemis project
Downstream area: Aposelemis river estuary and wetland

### ATTITUDE - KNOWLEDGE

1. I live / I activate in the area of Aposelemis river estuary ...
   - Permanently □
   - Occasionally □
   - Only in the summer period □
   - Other □

2. How long do you live / are you active in the area?
   - > 20 years □
   - 20-10 years □
   - 10-5 years □
   - <5 years □

3. Are you familiar with Aposelemis project?
   - Yes □
   - No □

### ENVIRONMENTAL OBSERVATION

4. During the last 6 years (since Aposelemis dam’s construction upstream):
   - (a) Have you observed any alteration of the river’s flow?
     - Reduced streamflow □
     - No difference □
     - Increased streamflow □
     - I don’t know □
     - Comments:
   - (b) In your opinion, river water quality at the estuary is ... (than before)
     - Worse □
     - The same □
     - Better □
     - I don’t know □
     - Comments:
   - (c) Have you observed any wetland alteration?
     - Yes □
     - No □
     - Comments:
   - (d) Have you observed any groundwater alteration in wells (during the last 6 years than before)?
     - Deteriorated quality. Increased brackish characteristics.
     - The well has been dried up.
     - No difference.
     - Other □
     - Please, explain to us:
   - (e) Have you observed any flow alteration in springs of the area?
     - Yes □
     - No □
     - I don’t know □
     - Comments:
   - (f) Have you observed any alteration of the coast front?
     - Reduced width □
     - Increased width □
     - No difference □
     - Comments:
   - (g) Have you observed any alteration of the landscape?
     - Yes □
     - No □
     - I don’t know □
     - Comments:

5. Especially during recent year 2019 and forward, have you observed any groundwater alteration in wells, compared with former years 2014-2018?
   - □ Improved quantity. Increased water volume in wells than period 2014-2018.
   - □ Improved quality. Decreased water’s brackish characteristics in wells than period 2014-2018.
   - □ No difference.
   - □ I don’t know.
   - □ Other. Please, explain to us:

### TODAY OPINION

6. In your opinion, are there any impacts due to the project on activities (i.e. agricultural, tourist etc) in your area?
   - No □
   - A little □
   - Medium □
   - Much □
   - Very much □
   - Please, explain to us:

7. In your opinion, is water for irrigation purposes sufficient in your area?
   - Yes □
   - No □
   - Please, explain to us:

8. In your opinion, is the supplied drinking water sufficient in your area?
   - Yes □
   - No □
   - Please, explain to us:

9. In your opinion, are there any general impacts due to the Aposelemis project?
   - No □
   - Yes, economical □
   - Yes, social □
   - Yes, environmental □
   - Yes, health □
   - Please, explain to us:

10. In your opinion, have the necessary mitigation/prevention/restoration measures been applied in the area?
    - No □
    - A little □
    - Medium □
    - Much □
    - Very much □
    - Comments:

11. Do you consider the Aposelemis project successful?
    - No □
    - A little □
    - Medium □
    - Much □
    - Very much □
    - Comments:

### OPINION FOR THE FUTURE

12. In your opinion, what is the future for the wetland, considering the implementation of the dam upstream?
    - It will be degraded □
    - It will stay as it is today □
    - It will be improved □
    - I don’t know □
    - Comments:

### PERSONAL CHARACTERISTICS

13. Gender: Male □ Female □
14. Age group: < 18 □ 18-24 □ 25-39 □ 40-54 □ 55-64 □ > 65 □
15. Marital status: Married □ Not married □ Divorced □ Widowed □
16. Educational level: Elementary school □ High school □ Technical studies □ University studies □ Postgraduate studies □
17. Profession/Occupation: Public sector □ Private sector □ Freelancer □ Pensioner □ Housekeeping □
18. Residence: □
Questionnaire for the investigation of observed environmental impacts due to Aposelemis project

**Cities of project’s water supply: Heraklion, Agios Nikolaos & Hersonissos**

### ATTITUDE - KNOWLEDGE

1. I live / I activate in the city of...
   - Heraklion ☐
   - Agios Nikolaos ☐
   - Hersonissos ☐

2. I live / I activate in the area...
   - Permanently ☐
   - Occasionally ☐
   - Only in the summer period ☐
   - Other ☐

3. Are you aware of water supply’s origin (in your house or business)?
   - Yes ☐
   - No ☐
   - If Yes, please tell us:

4. Are you familiar with Aposelemis project?
   - Yes ☐
   - No ☐

### OPINION - OBSERVATION

5. During the time period before year 2015:
   - (a) Did drinking water supply quantity problems exist in your region?  
     - No ☐
     - A little ☐
     - Medium ☐
     - Much ☐
     - Very much ☐
     - Comments:
   
   - (b) Were there any interruption events of water supply in your region, due to water shortage?  
     - Yes ☐
     - No ☐
     - Comments:

6. During time period of years 2015 - 2018:
   - (a) Did drinking water supply quantity problems exist in your region?  
     - No ☐
     - A little ☐
     - Medium ☐
     - Much ☐
     - Very much ☐
     - Comments:
   
   - (b) Were there any interruption events of water supply in your region, due to water shortage?  
     - Yes ☐
     - No ☐
     - Comments:

7. Today, during the time period of years 2019 - 2020:
   - (a) Do drinking water supply quantity problems exist in your region?  
     - No ☐
     - A little ☐
     - Medium ☐
     - Much ☐
     - Very much ☐
     - Comments:
   
   - (b) Are there any interruption events of water supply in your region, due to water shortage?  
     - Yes ☐
     - No ☐
     - Comments:

(c) Do water supply quality problems exist in your region?  
   - No ☐
   - A little ☐
   - Medium ☐
   - Much ☐
   - Very much ☐
   - Comments:

(d) Do you drink tap water?  
   - Yes, with filter ☐
   - Yes, without filter ☐
   - No, bottled water only ☐
   - Other ☐

(e) If No (if you don’t drink tap water), please tell us why  
   - In my opinion, tap water is not potable, due to poor supply network and storage conditions. ☐
   - I don’t like water quality / taste, due to chemical treatment (i.e. chlorination etc). ☐
   - I don’t like water quality / taste, due to brackish characteristics (salty water). ☐
   - I don’t trust tap water origin. (In my opinion, the water from the dam and/or wells is of poor quality) ☐
   - I am accustomed to drink bottled water. ☐

### OPINION FOR THE FUTURE – WILLINGNESS TO PAY APPROACH (Application in cases that don’t drink tap water)

11. An estimation of your annual costs on bottled water purchase, reaches the value of...
   - <100 € ☐
   - 100-200 € ☐
   - 200-300 € ☐
   - 300-400 € ☐
   - 400-500 € ☐
   - >500 € ☐
   - Comments:

12. In your opinion, does bottled water consumption burden the environment (i.e. discarded plastic bottles)?:
   - No ☐
   - A little ☐
   - Medium ☐
   - Much ☐
   - Very much ☐
   - Comments:

13. Are you interested in the improvement of your area’s water supply network (i.e. new pipes, building top water tanks’ removal etc), so that you can drink tap water?  
   - No ☐
   - A little ☐
   - Medium ☐
   - Much ☐
   - Very much ☐
   - Comments:

14. Which is the total amount you are willing to pay for the supply network’s improvement?  
   - Nothing ☐
   - 50 € ☐
   - 100 € ☐
   - 200 € ☐
   - 300 € ☐
   - 400 € ☐
   - >500 € ☐
   - Comments:

15. Would you prefer a municipal payment.
   - Annual (once) ☐
   - Monthly (in parts) ☐
   - Other / Comments:

### PERSONAL CHARACTERISTICS

16. Gender:  
   - Male ☐
   - Female ☐

17. Age group:  
   - < 18 ☐
   - 18-24 ☐
   - 25-39 ☐
   - 40-54 ☐
   - 55-64 ☐
   - > 65 ☐

18. Marital status:  
   - Married ☐
   - Not married ☐
   - Divorced ☐
   - Widowed ☐

19. Educational level:  
   - Elementary school ☐
   - High school ☐
   - Technical studies ☐
   - University studies ☐
   - Postgraduate studies ☐

20. Profession/Occupation:  
   - Public sector ☐
   - Private sector ☐
   - Freelancer ☐
   - Pensioner ☐
   - Housekeeping ☐
   - Unemployed ☐
   - Student ☐
   - Farmer ☐

21. Residence:

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Additional Photographic Material
Fig. S1 Aposelemis reservoir under full capacity conditions (January 2020).

Fig. S2 Aposelemis dam controlled overflow procedure (January 2020).
Fig. S3 Aposelemis dam and reservoir, under full capacity conditions (2020). Photo taken by Spyros Lianakis and displayed with his permission.

Fig. S4 Aposelemis reservoir in early Spring 2020.
Whether the colourful graphics on building walls consist vandalism or art expression is a matter of opinion. At the same time, the drawing of airbnb logo (on the upper left building) creates a caustic statement that reflects modern Hellenic society’s questioning.

![Fig. S5 Sfendyli flooded village in Aposelemis reservoir, under full capacity conditions (January 2020).](image)

![Fig. S6 Sfendyli village in Aposelemis reservoir, after the summer period (early September 2020).](image)
Fig. S7 Flooded Sfendyli village from above (2020). Photo taken by Spyros Lianakis and displayed with his permission.

Fig. S8 View of the Aposelemis reservoir through a window of desolated Sfendyli village (2020). Photo taken by Spyros Lianakis and displayed with his permission.
**Fig.S9** NW part of Lasithi Plateau from above (Spring 2020). The figure illustrates Chavgas stream. Sinkhole isolation work at the road’s bridge puts a stop to the streamflow. At the middle right Chonos sinkhole can be seen. At the bottom left, part of the main trench of the project is illustrated. Photo taken by Spyros Lianakis and displayed with his permission.

**Fig.S10** SE part of Lasithi Plateau from above (Spring 2020). The figure illustrates the two artificial reservoirs for irrigation purposes, as Aposelemis project’s compensation measure. Photo taken by Spyros Lianakis and displayed with his permission.
Fig. S11 Flooded Lasithi Plateau in early January 2020. The landscape is reflected on the flood water. Photo taken by Spyros Lianakis and displayed with his permission.

Fig. S12 Flooded Lasithi Plateau (early January 2020). Photo taken by Spyros Lianakis and displayed with his permission.
Fig.S13 Lasithi Plateau in late January 2020, while the flood water is receding.

Fig.S14 Same as above.
Fig. S15 Lasithi Plateau under snow conditions (February 2020). The figure illustrates the main trench of the project.

Fig. S16 Sinkhole isolation work in Lasithi Plateau, under snow conditions (February 2020).
Fig. S17 Lasithi Plateau under snow conditions (January 2021). Photo taken by Spyros Lianakis and displayed with his permission.

Fig. S18 Artificial reservoir in SE Lasithi Plateau for irrigation purposes, as Aposelemis project’s compensation measure (January 2020).

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