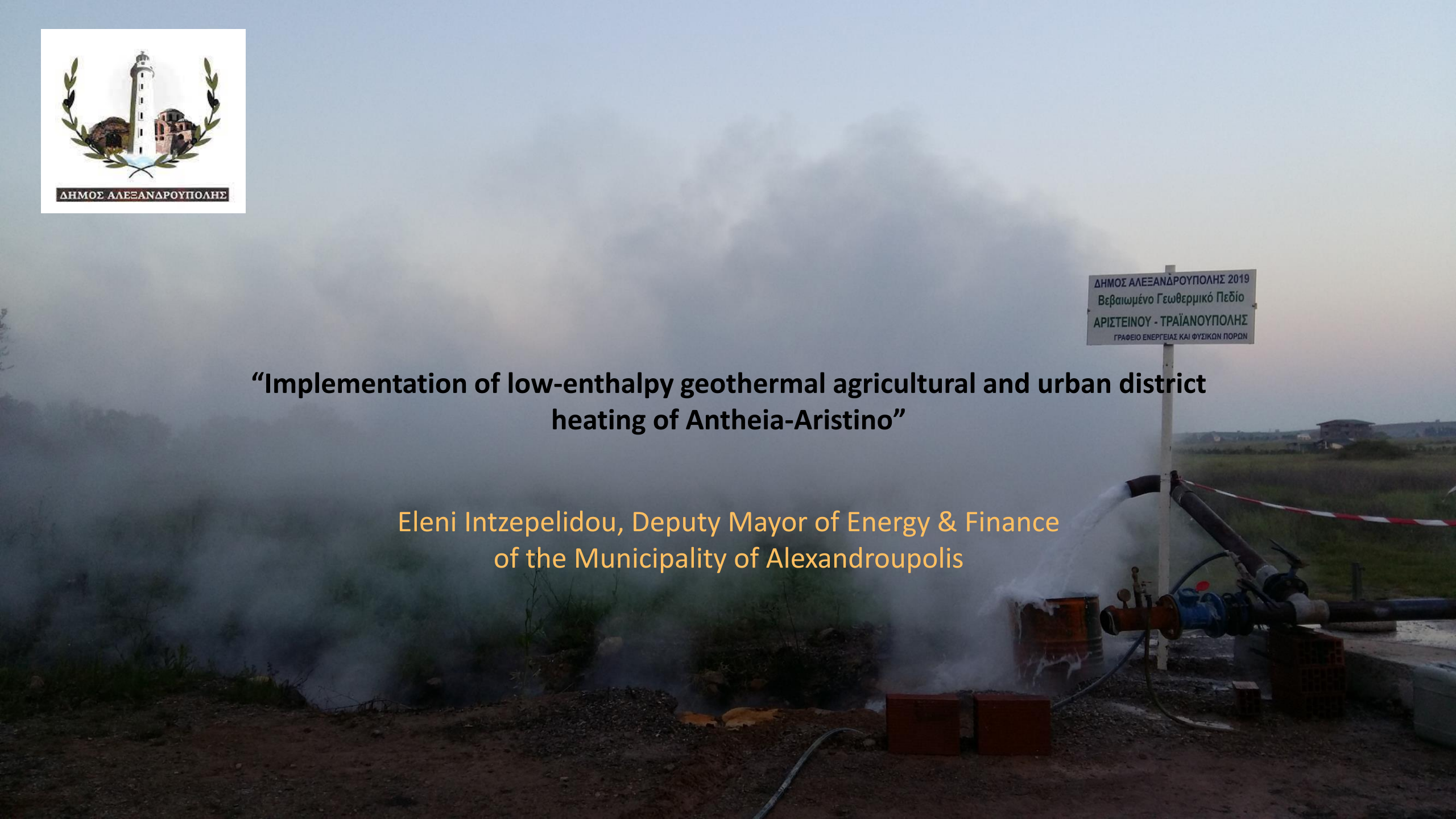




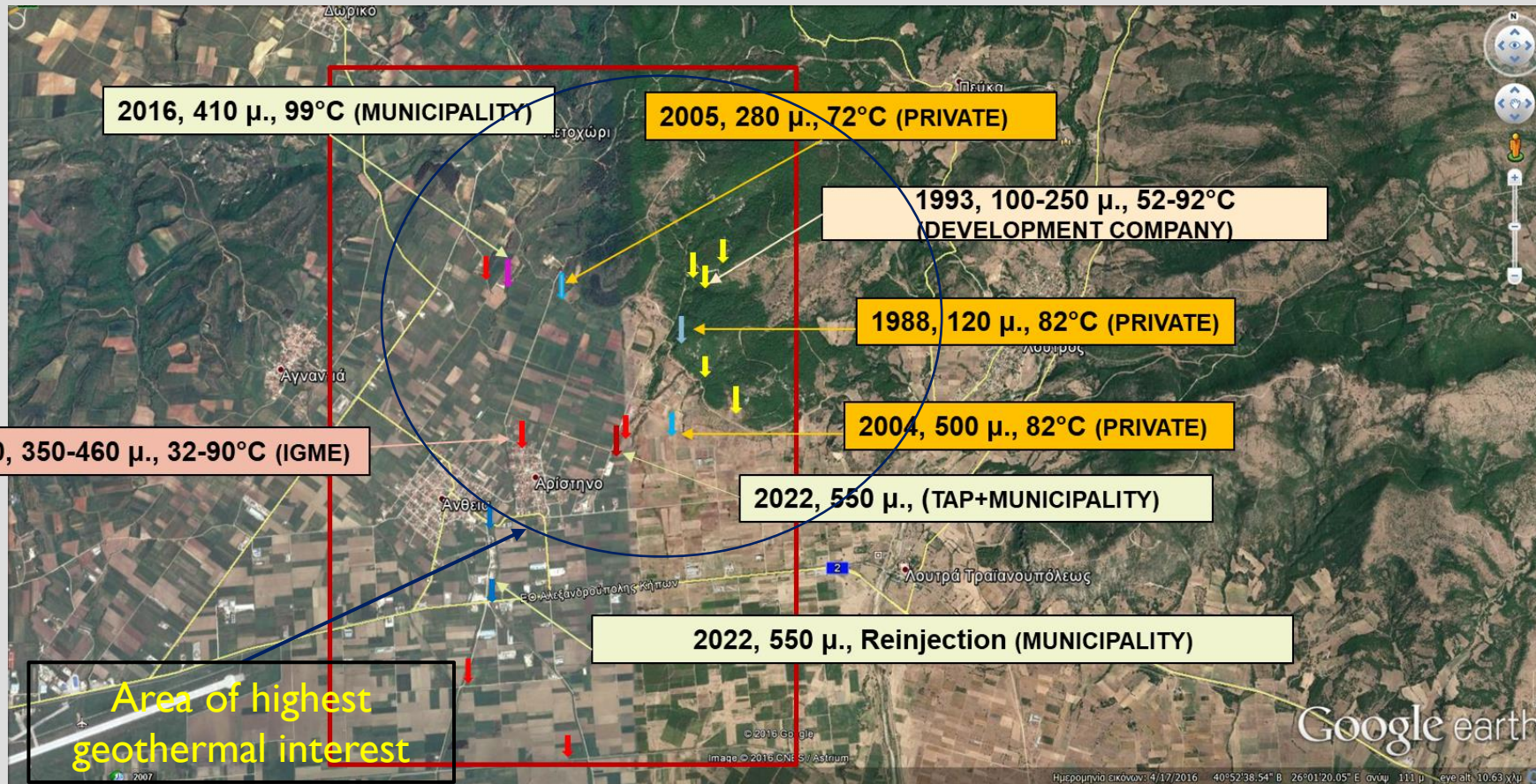
“Implementation of low-enthalpy geothermal agricultural and urban district heating of Antheia-Aristino”

Eleni Intzepelidou, Deputy Mayor of Energy & Finance
of the Municipality of Alexandroupolis

ΔΗΜΟΣ ΑΛΕΞΑΝΔΡΟΥΠΟΛΗΣ 2019
Βεβαιωμένο Γεωθερμικό Πεδίο
ΑΡΙΣΤΕΙΝΟΥ - ΤΡΑΪΑΝΟΥΠΟΛΗΣ
ΓΡΑΦΕΙΟ ΕΝΕΡΓΕΙΑΣ ΚΑΙ ΦΥΣΙΚΩΝ ΠΟΡΩΝ



DRILLING WORKS IN THE ARISTINO GEOTHERMAL FIELD: OVERVIEW



Investigations in the area have started in the late 80's and continue over time since today.

Twenty boreholes were drilled at depths from 120 to 500m.

The most promising area covers almost 12 km² with temperatures ranging from 50°C to 99°C.

The thermal energy load available for direct uses should exceed 50 MWth.

The drilling of the new production well AA-6Π at 410m depth and the production tests highlighted the significant energy potential of the geothermal fluids. Fluid's temperature was measured at **99°C** (2019), which is the maximum temperature ever measured among all known low enthalpy geothermal fields in Greece.



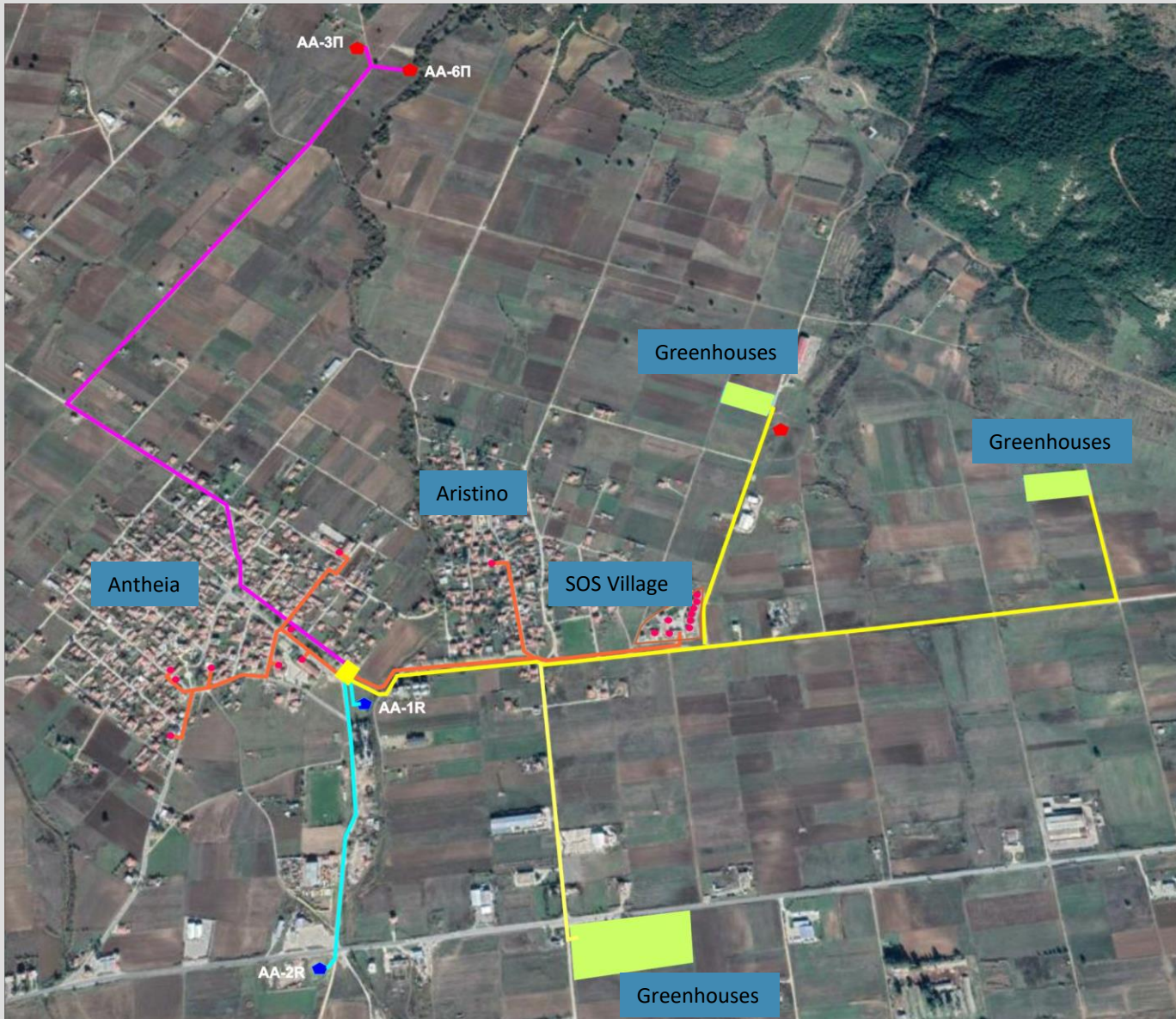
**GEOHERMAL
INFRASTRUCTURE PROJECT
(2020-2022)**

Budget: 6.000.000€

**IMPLEMENTATION
PHASE**



1ST PHASE OF THE DISTRICT AND AGRICULTURAL HEATING PROJECT (2020-2022)(IMPLEMENTATION PHASE)



- ✓ Use of the AA3 και AA6 production wells with 150 m³/h maximum usable flow rate and minimum initial operating temperature 90°C (maximum installed heat capacity: 9,6 MWth).
- ✓ **End Uses:**
 - ✓ Space heating of most of the local public buildings where heating needs are covered by the Municipality of Alexandroupolis (20% of the available heat load).
 - ✓ Heating on demand of agricultural end uses with emphasis to the greenhouses (5-6 ha maximum) (80% of the available heat load).

Geothermal water and recirculation fresh water to the end users will be carried through extended plastic pipes (PP) buried networks with a total length of 16.000 m.

WELL AA3



110 m³/h, t=89°C

1ST PHASE OF THE IMPLEMENTATION WORKS IN PROGRESS



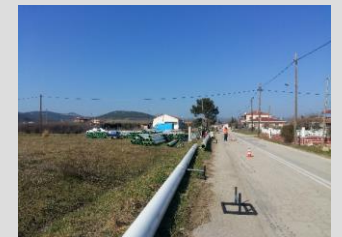
WELL AA6



40 m³/h, t=99°C



Thermal Station
Inside view



Secondary recirculation pre-insulated networks

PROJECT IMPLEMENTATION PROGRESS

1. THERMAL STATION: >60%
2. PRIMARY NETWORK-REINJECTION BRANCH: >80%
3. AGRICULTURAL HEATING SECONDARY NETWORKS: >60%

PUBLIC BUILDINGS OF THE GEOTHERMAL DISTRICT HEATING PROJECT

Buildings of the Municipality - Church



Primary School of Antheia



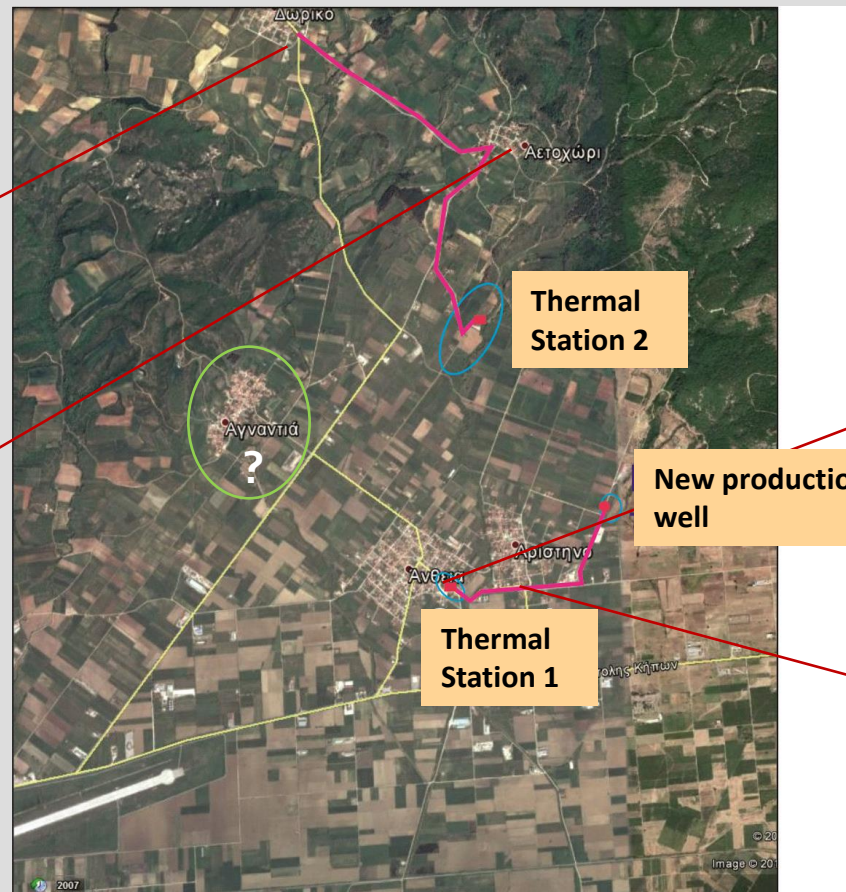
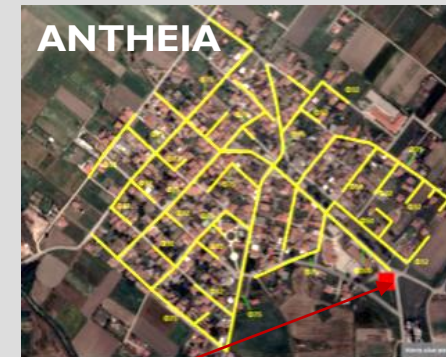
Secondary School of Antheia



SOS Children's Village
Accommodation Facilities
(Eight residences)



2ND PHASE OF THE DISTRICT HEATING PROJECT



Community	Population	Residences
Antheia	780	310
Aristino	455	181
Doriko	252	100
Aetochori	80	31
Total	1567	622

3,0 MWth → 100 m³/h → New production well, Thermal station 1

0,8 MWth → 30 m³/h → New thermal station 2

In conclusion

- The good quality and the high initial temperature of the geothermal fluids are advantageous for future district heating projects comprising all villages located inside or in the vicinity of the geothermal field (six villages in total).
- Besides the obvious social contribution and community service of the Municipality of Alexandroupolis, the strongest prerequisite for a successful future implementation on the matter is the necessary cost effectiveness and viability as well.
- In the frame of the prefeasibility study some first indicative parameters in this direction seem to be positive:
 - ✓ Thermal energy can be delivered at a price as low as 0,04€/KWh, that is 10-20% lower than the so far cheapest energy source utilized (wood).
 - ✓ For a 15 years depreciation period the net present value and the corresponding internal rate of return are both positive.

All the above mentioned should be thoroughly re-evaluated in the frame of a well documented feasibility study.

➤ **Highlights of the geothermal field**

- The geothermal area of Antheia-Aristino is characterized by a widespread thermal anomaly.
- The upper productive reservoir with temperatures between 50-99°C exceeds 1200 hectares.
- The expected total flow rate of the geothermal waters up to 99°C might exceed 500 m³/h, delivering a thermal capacity in the order of 40-50 MWth in multiple energy stages (99-90 power generation, 90-70 space heating, 70-30 agricultural end uses).
- The utmost challenge and expectation for the Municipality of Alexandroupolis is the prospection and exploitation of the presumed deeper geothermal system with expected temperatures higher than 140°C for power generation.

Given all the above the geothermal field under consideration can be characterized as the most important low enthalpy field in Greece either in terms of energy efficiency or in terms of initial MWth installation cost and MWh production cost.

Thank you all for your attention