



## Usage of Drones in Local Governments: A Case Study of River Stream Monitoring

*Kostadin Mishev, Aleksandar Stojmenski, **Igor Mishkovski** and Dimitar Trajanov*

# Motivation

- ▶ The local government problem
  - ▶ Traditional detection of physical and chemical contaminants in the water
  - ▶ Several times per year
- ▶ Two big important rivers (Vardar and Lepenec)
- ▶ Administrative and technological problems in the local government
- ▶ Unreachable terrains



# Problem #1

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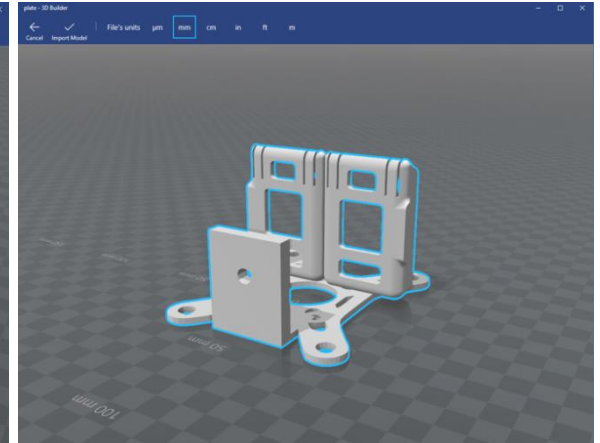
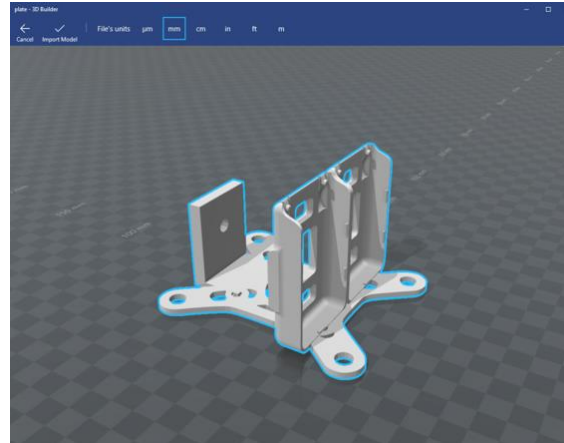
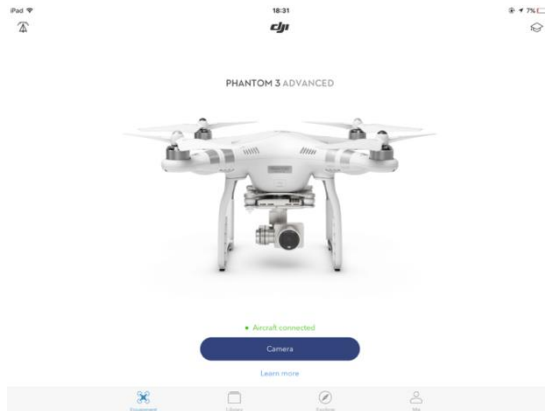


# Problem #2

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# Equipment



Model Number	Vue Pro 640
Thermal Imager	Uncooled VOx Microbolometer
Resolution	640 × 512
Lens Options (FOV for Full-Sensor Digital Output)	9 mm; 69° × 56° 13 mm; 45° × 37° 19 mm; 32° × 26°
Lens Options* (FOV for NTSC Analog Output)	9 mm; 62° × 49° 13 mm; 45° × 35° 19 mm; 32° × 24°
Spectral Band	7.5 - 13.5 $\mu$ m
Full Frame Rates	30 Hz (NTSC); 25 Hz (PAL) <i>US only, not for Export</i>
Exportable Frame Rates	7.5 Hz (NTSC); 8.3 Hz (PAL)

## Mobius 1 ActionCam V3

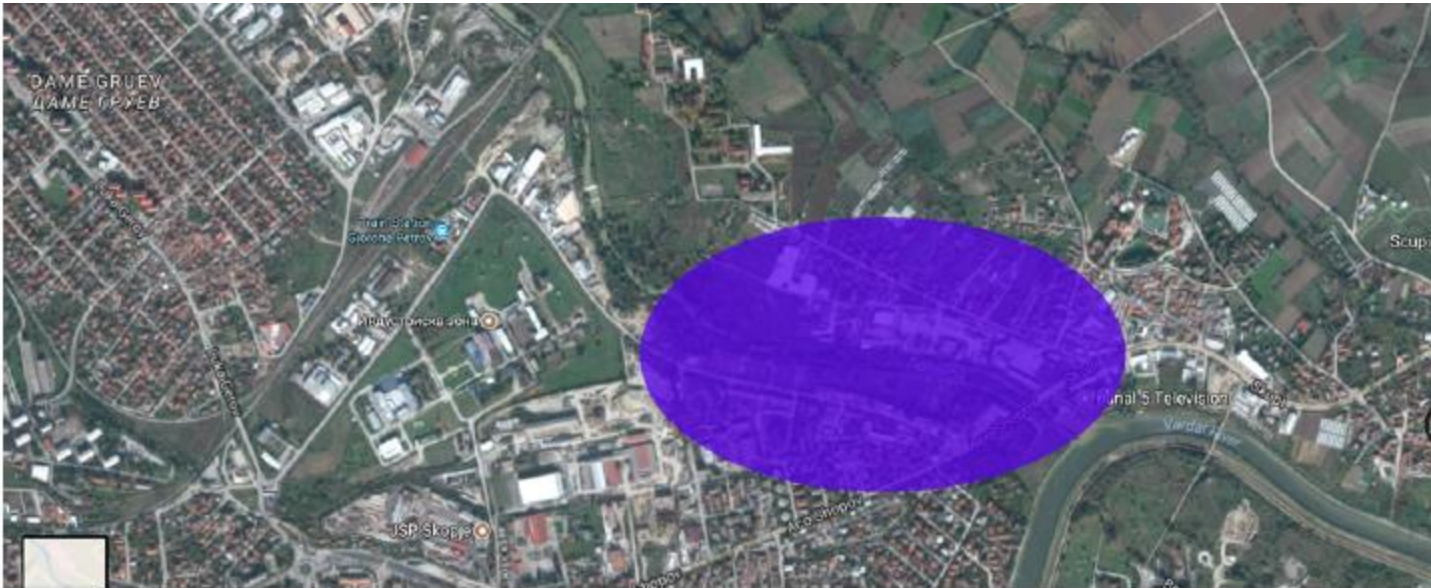


**1080p HD H.264 codec**  
**1920x1080 @ 30fps .mov - 87° Lens**

# Monitoring flight details

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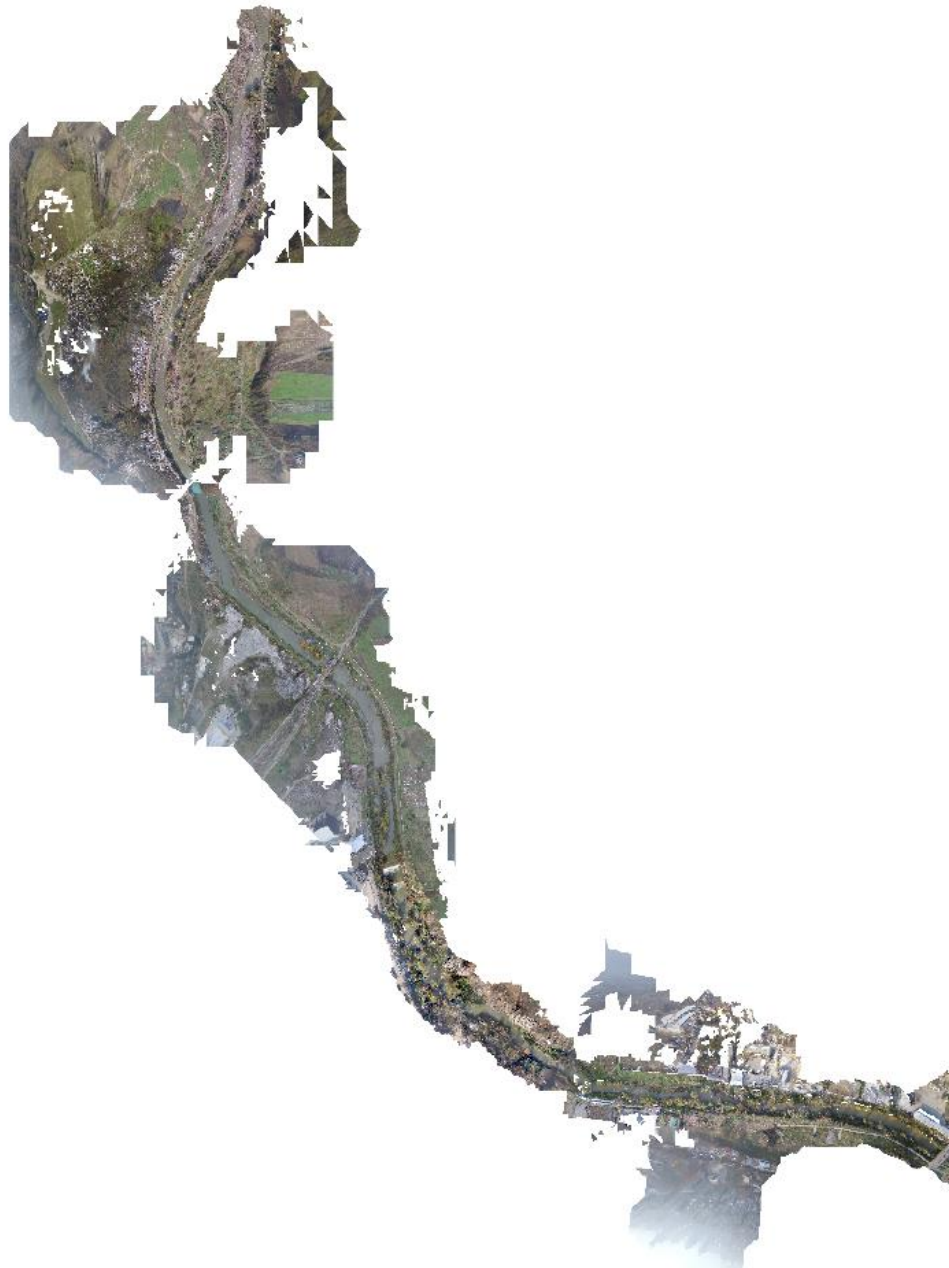
- ▶ 7 flights covering around 4 km of the river stream





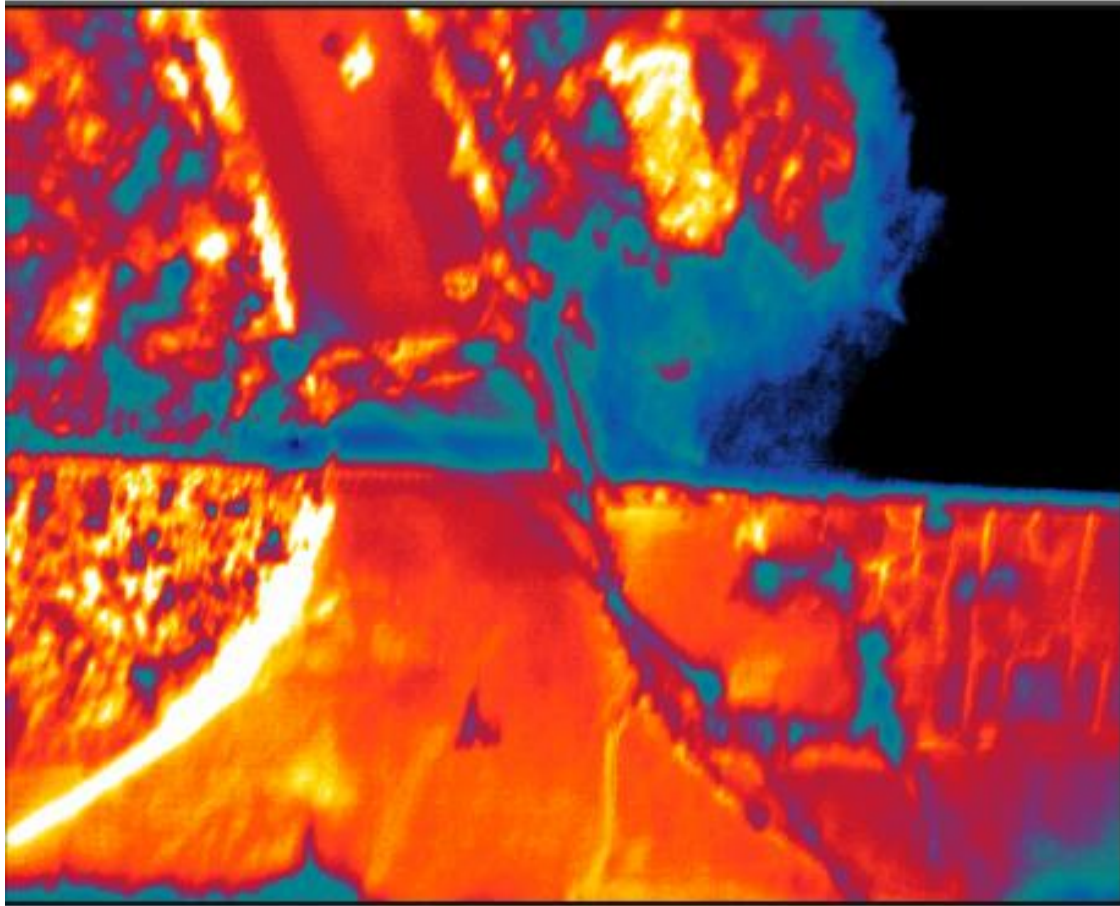
# Ortophoto

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# Results #1

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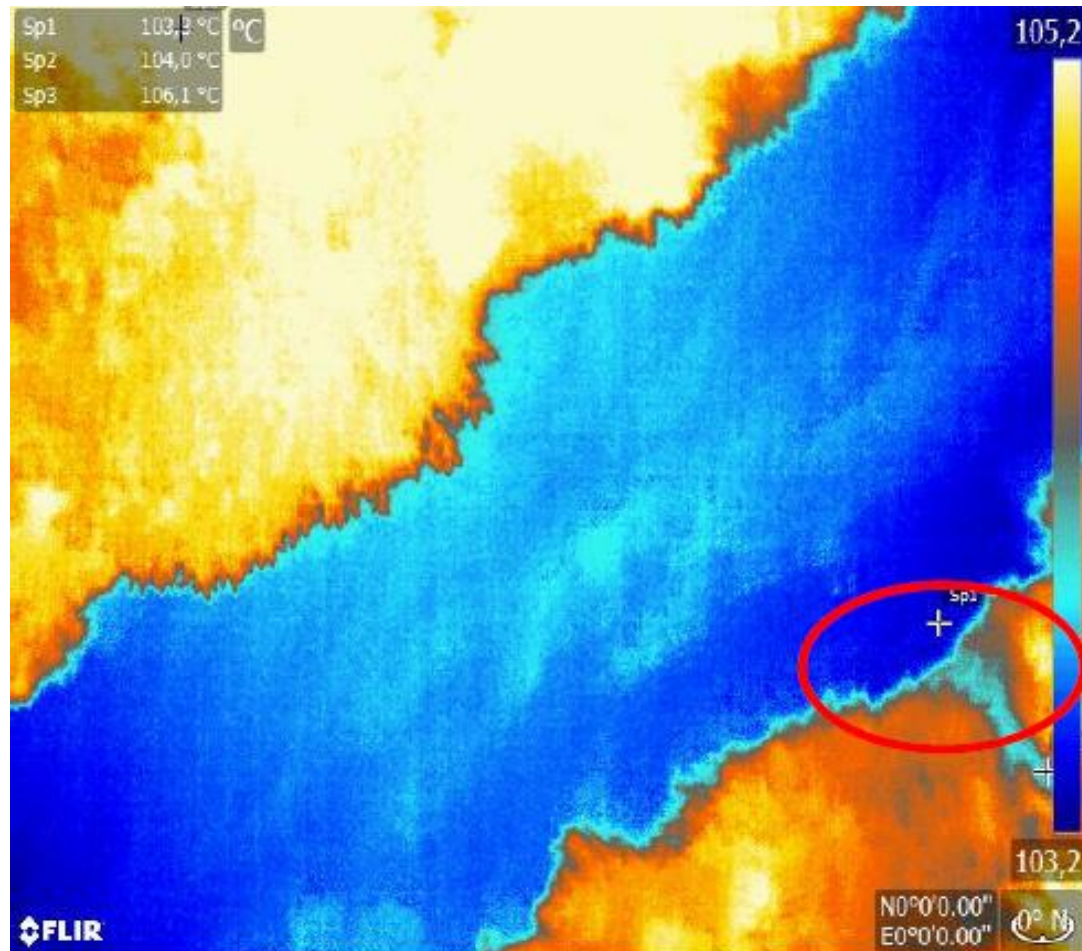
# Results #2

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# Results #3

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# Landfills





# Conclusion

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- ▶ Framework for monitoring of riverbed and quality of water of rivers by using modern technology like UAV, thermal camera, standard (RGB) camera and software for aerial image processing
- ▶ **The framework was developed together with the local government in Skopje and state institutions who control the quality of flowing water**
- ▶ **The local government is now trained and uses this platform because**
  - ▶ it provides economical, fast and relatively simple method for supervising the rivers' status and makes accurate 3D riverbed models.