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TIEPOINT

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Sławomir Kosieliński

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Although it would seem that drones are ubiquitous, their use in crisis management and response support still appears to be a technical novelty. In a way, rightly so, but mainly because of the change in the way information on the tactical or operational-strategic situation is obtained. In the wake of this, the information needs of the services are increasing. So how did the drones perform during the September 2024 floods?

Sławomir Kosieliński,
Micromacro Institute Foundation, droniada.eu

You flew for us for six years. You were in the air for 380 hours, including 110 hours in April 2020 during a fire in the Grzędy bog in the Biebrza National Park. I know, I know, on your last mission in Ladek-Zdrój you flew in bloody difficult conditions. It was raining cats and dogs, but you bravely showed what you could see from the sky. You completed the mission. And just as you were about to land, you tilted 90 degrees and started shaking from side to side. I had to bring you down to the ground in ATTI[1] mode. There it turned out that there was a deadly short circuit in the engine. No more flying into action, the firefighter's DJI Matrice 200 drone.

This is what a farewell letter to the constructors of this drone from young Brigadier Stefan Ostrowski, provincial coordinator for unmanned aerial vehicles at the Provincial Headquarters of the State Fire Service in Białystok, might have looked like.

Stefan Ostrowski arrived in Ladek-Zdrój on Monday evening 16 September. The next day he went into action. He flew the fully professional DJI Matrice 200 mentioned above, as well as the semi-amateur DJI Mini Pro 3 pro and DJI Air2s. - It turned out that most of the tasks could easily be carried out with these smaller units. - He explains. - Maybe I wouldn't let them out in the rain, but for observation and taking pictures they were enough. Besides, they were quicker to launch, even out of hand.

1 Attitude mode disables vision-based positioning aids and GPS positioning.The pilot therefore guides the drone without the aid of automatic corrections, having to manually control the effect of wind and descent speed.

Also surviving in Lądek-Zdrój is the St. John's Bridge, a two-span stone bridge over the Biała Lądecka River built in 1565 of broken stone using a lime binder with the addition of hen's egg whites.
But water has washed away the stone railings and the entire pavement, as well as the 18th century statue of St John of Nepomuk.

Photo S. Ostrowski

The market square in Lądek-Zdrój after the passage of the flood wave.

Photo S. Ostrowski

Above Lądek-Zdrój lies Stronie Śląskie. It was there, on September 15 (Sunday) at 10.35 a.m. that the dam on the flood control reservoir on the Morávka River burst. . The huge wave hit buildings first in Stronie, then it poured into the Biała Lądecka, which it used to reach Lądek-Zdrój, and then it swept towards the Nysa Kłodzka, including Kłodzko, causing gigantic damages along the entire way.

Photo S. Ostrowski

What can be seen from 120 metres?

Above Lądek-Zdrój lies Stronie Śląskie. It was there, on 15 September (Sunday) at 10.35 a.m. that the dam on the flood control reservoir on the Morawka River burst. A huge wave hit the buildings first in Lądek-Zdrój, then poured into the Biała Lądecka, which reached Stronie, and then rushed towards the Nysa Kłodzka, including Kłodzko, causing gigantic damage along the entire way.

By Sunday, Lądek-Zdrój was already covered in mud, sludge and gravel. Various household equipment, fragments of trees, footbridges and fences were stuck in it. Half-broken houses could be seen, revealing what individual rooms hid inside, such as tables, cupboards or sofas.

- The first task was to determine the state of damage - recalls Stefan Ostrowski. - Our cameras confirmed that of the 10 bridges, only one had survived and could be driven over by heavy vehicles.

Yes, St. John's Bridge - a two-span stone bridge over the Biała Lądecka River, built in 1565 from broken stone using a lime binder with the addition of egg whites - has also survived. But water has washed away the stone railings and the entire surface, as well as the 18th century statue of St. John of Nepomuk.

This Prague confessor was thrown off the Charles Bridge in Prague into the Vltava River on 20 March 1393 because he refused to reveal his wife's sins to King Wenceslas IV. After his death, he became the patron saint of bridges, a saint who protected fields and crops from drought and floods. This time he did not help.

The city was cut off from the world, with no running water, electricity or telephonic communication. In order to be able to help effectively, information about the passability of roads had to be updated on an ongoing basis. - On the one hand, we were transmitting images from the drone to the Wroclaw headquarters, while on the other hand we were checking how many potholes had appeared in the roads and whether it was possible to drive heavy equipment through them.

Once the water had subsided, it was possible to begin mapping the site and determining the scale of the damage. For geo-information analyses, Stefan Ostrowski used OpenDrone- Map, an open source photogrammetry toolkit which allows drone images to be converted into maps and 3D models. Incidentally, the software has been installed on a server at the State Fire Service Headquarters so that any pilot can remotely process the acquired images. What if the fire service had its own unified incident visualisation system combining satellite and drone imagery?

Głuchołazy under water

The September flood matched and sometimes even surpassed the level set in July 1997 in terms of strength and brutality. In addition, it simultaneously attacked more than a dozen areas of the Oder river basin, including the Kłodzko Basin, the Głuchołazy and Racibórz areas.

On the morning of Sunday 15 September, the water of the Biała Głuchołaska River overflowed the embankments defending Głuchołazy and flooded the town. An

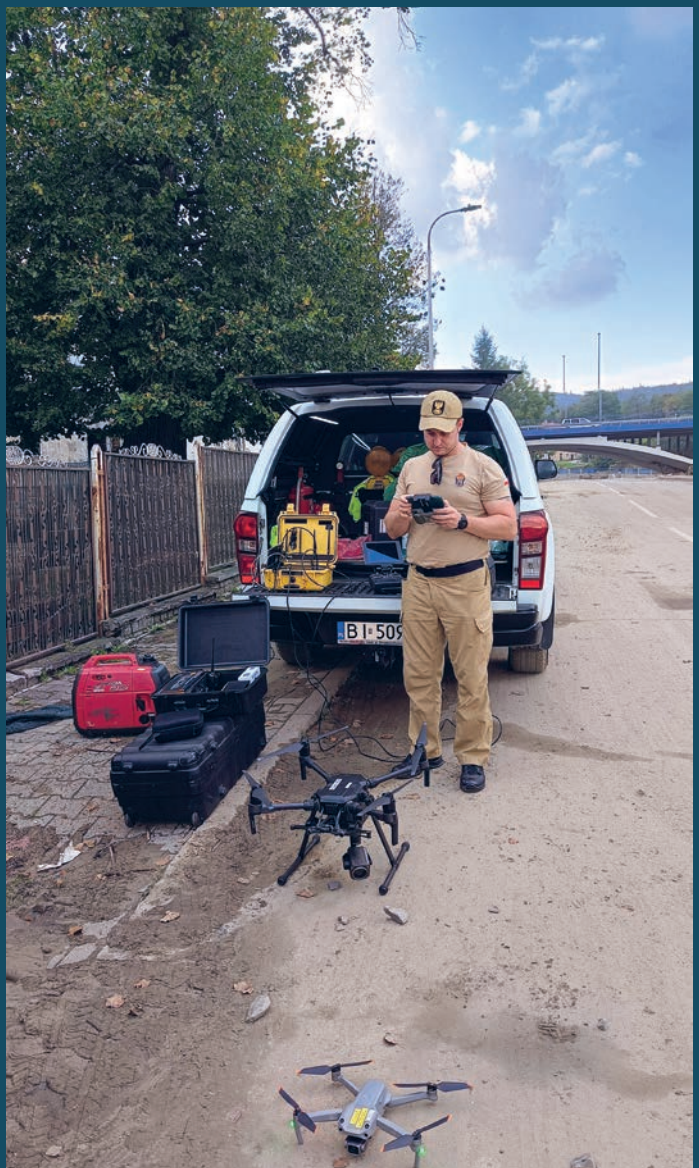
St John's Bridge on the Biała Lądecka on the screen of the drone apparatus.

Photo S. Ostrowski

Below, young asp. Kamil Zwoliński, KW PSP in Bialystok during the action

Photo S. Ostrowski

Next to the loading of equipment against the background of the destroyed St John's Bridge



evacuation began. The market square was under water. But this was not the biggest problem.

The Biała Głuchołaska carried trees from the mountains. They hit the temporary bridge in Głuchoła- zy. The wooden structure collapsed into the water and floated towards the new bridge, which the General Directorate for National Roads and Motorways (GDDKiA) was to open in 2025. Houses along the river - Andersa and Jana Pawła II streets - were also destroyed. The city looked as if a front had just rolled through. Losses were estimated at almost at 1 billion zlotys. But before reconstruction could begin, silt, debris, rubbish and sludge had to be removed. And at the same time the supply of clean water and electricity had to be ensured. It was then that the second wave of aid arrived - firefighters from Chojnice and Gdansk, among others, went into action.

– We arrived in Głuchołazy on 19 September (Thursday) at around 10 p.m. The next day we went into action. We had a DJI Matrice 210 and a DJI Mini 3 Pro at our disposal. After some time, we were joined by Maciej Górski from TPI Ltd. with his DJI M300, DJI M30T and DJI Mavic 3T. - recalls Brigadier Robert Węsierski, provincial coordinator for unmanned aerial vehicles at the Regional Headquarters of the State Fire Service in Gdansk.

One just had to ask what he saw on his first flight in Głuchołazy. He remembered it well.

– The water in the altered riverbed rushed directly onto the photovoltaic farm. That's something you can't forget. - he says.

In the city, only one bridge at the Schattdecor plant - a manufacturer of finish foils and varnishes for the furniture industry - survived. Although water entered the production hall, warehouse and offices, the company did not turn its back on the city and made its in-house John Paul II bridge available for the rescue operation. This enabled firefighters, the military and other services to operate fairly effectively. - It was inevitable that I had to make sure that this road was passable. Traffic jams lasting several minutes were forming. Observing vehicle traffic from a drone initially became one of the main tasks for our pilots - explains Brigadier Błażej Chamier Ciemiński, Deputy Commander of the Pomeranian Voivodeship Fire Service in Gdańsk, who was delegated to Głuchołazy to coordinate the operation.

– This included flyovers around the sewer collector or patrolling the riverbed. And the river was depositing gigantic masses of sand in places where there had never been any - adds Robert Węsierski. Finally, after two days, we were able to start mapping the area and making geospatial analyses. We focused our special attention on the damage to the Głuchołów waterfall and the collapsed bridge in Sikorskiego Street near the market square.

According to Błażej Chamier Ciemiński, this information was invaluable, significantly speeding up the decision-making process. - Without the drones, we would have been doomed to wait for hours for reports from our firefighters, who sometimes even had to get to the region of interest on foot. And now the drone would take off and after a while we had a picture of the tactical situation on the screen.

A new feature that proved very useful in this operation was a special trailer prepared by the Chojnice OSP (unit of the Volunteer Fire Service) for the drone team's operations. It contained a workspace for the drone pilots, its own power supply and a large monitor to compare images from before and after the flood. – From now on, I believe that drone teams must have their own vehicle modelled on a so-called company

A novelty that was very successful in this action was a special trailer prepared by the Chojnice OSP drone team's operations. It contained a workspace for the drone pilots, its own power source and a large monitor on which to compare pre- and post-flood images.

Photo B. Chamier Ciemiński

Pilots in a drone trailer.

Photo B. Chamier Ciemiński

In the foreground, asp. Karol Górnowicz from the Chojnice Fire and Rescue Unit, behind Maciej Górski with TPI sp. z o.o. on the way to the flight site

Photo D. Frymark

mobile command and communications station. This is the basis for well-organised and well thought-out work of firefighter drone pilots. Now, the trailer had to suffice. Thanks to its presence Robert Węsierski and firefighter Krzysztof Lieder (Gdańsk City Fire Brigade) could run image rendering on their computers and set off on subsequent patrols - recalls Błażej Chamier Ciemiński.

What can be seen from 500 metres?

If there were only firefighter drones in the air, flying would be quite easy. In the meantime, Lądek-Zdrój and Głuchołazy had become overcrowded with all kinds of aircraft of various users: military helicopters, police helicopters, border guards, Air Rescue, drones of the Territorial Defence Forces, local authorities, media and private individuals.

The drones of Stefan Ostrowski and Robert Węsierski were flown roughly up to 120 metres AGL. The 500-metre ceiling was taken by unmanned FlyEye airframes. On 16 September, two machines from the 12th Wielkopolska and 8th Kujawsko-Pomorskie Territorial Defence Brigades began flying. Two days later, a drone team of their manufacturer Flytronic joined the action.

–We focused on monitoring the passage of the flood wave and transmitting the image online to the Wrocław command centre from the vicinity of Lądek-Zdrój - recalls the pilots from Flytronic. - We then followed the wave successively down the Nysa Kłodzka and Odra as far as Kostrzyn in the Lubuskie Voivodeship.

Providing operational and strategic information from a ceiling of 5,000 metres was the Bayraktar T2B from the 12th Unmanned Aircraft Base in Mirosław. It was particularly useful at night, when optical satellite imagery could not be acquired.

And how do you control so many 'birds' in the air?

– Initially, we tried to manage the airspace by creating six geographical zones over the flood-affected cities: Głuchołazy, Prudnik, Nysa, Kłodzko, Lądek-Zdrój and Paczków. But as pilots of manned aircraft began to repeatedly ignore them, we found this solution ineffective and began to create so-called R (Restricted) zones. In total, we established 32 R zones through the DSS Services2[2] application, in which no helicopter, aircraft, copter or winged drone could operate without our permission - says Capt. Marcin Klecz, national coordinator for unmanned aircraft at the State Fire Service Headquarters.

Generally, pilots followed the rules and informed the zone managers of their flights by telephone. – I personally managed 24 R zones. Every day I received 600-700 calls asking for permission to fly there. Now I know that the next time we need to delegate zone management to the level of provincial coordinators" admits Marcin Klecz.

However, various incidents involving R-zone violations by pilots of manned aircraft could not be avoided. These were mainly military pilots, but also paragliders and sport aircraft pilots.

2 Dynamic Safety & Security – Services. It is an application of the Polish Air Navigation Services Agency which allows state institutions to electronically request the introduction of immediateand temporary restrictions on access to airspace in connection with rescue, public order or national security operations.

Broken bridge in Sikorskiego Street near the marketplacein Głuchołazy.

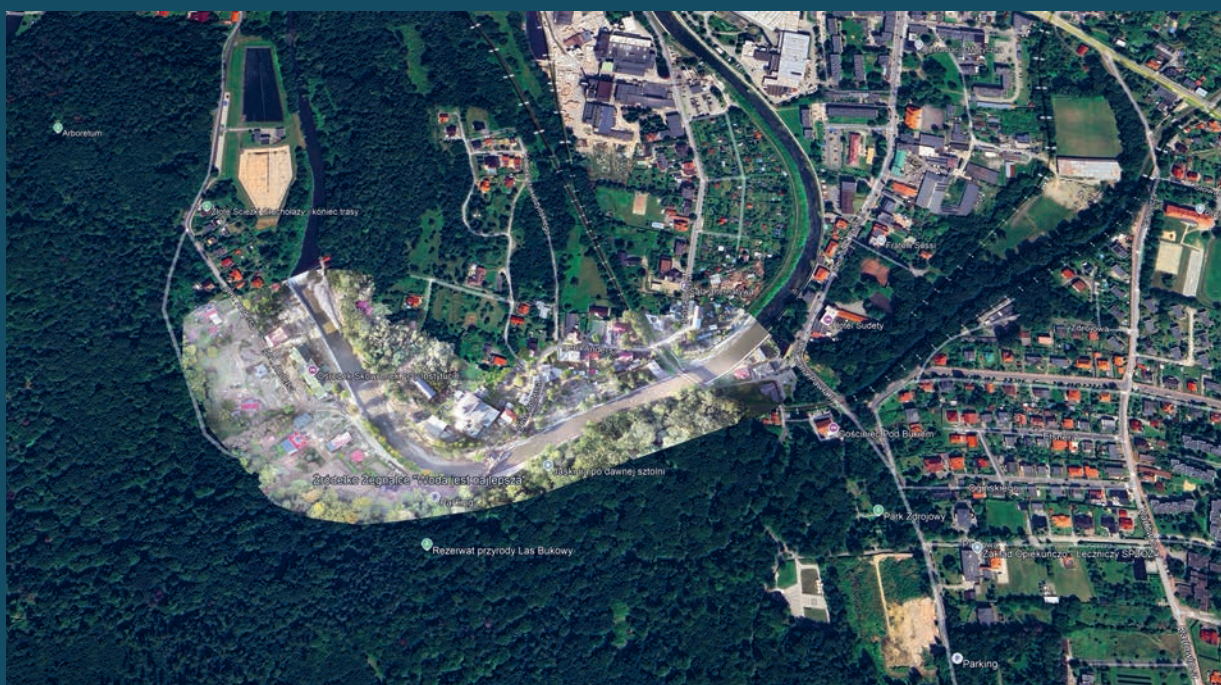
Photo: K. Lieder and R. Węsierski

A satellite image was superimposed on the from a drone showing changes in the vicinity of the sewage collector in Głuchołazy.

Photo: K. Lieder and R. Węsierski

Analysis of the condition of the bridges over the Biała Głuchołaska River

Photo: K. Lieder and R. Węsierski



– Our zone allowed flights up to 1100 ft. (335 metres AGL). Suddenly, while we were conducting a mission, a Czech BRM Aero Bristell low-wing aircraft appeared out of nowhere. I could have seen it in Flightradar, but its transponder was losing range every now and then. It circled over Głuchołazy and then returned to itself, unaware of how many 'polite verbal bundles' were sent after him - recalls Robert Węsierski. According to him, the biggest problem was the contact with General Aviation (GA) pilots who were invisible to the Flight Information Service (FIS) and military pilots with total disregard for civil regulations.

- In the course of flying, we had several close encounters with paragliders, a stray avionet or a military helicopter - say the pilots of Fly- tronic S.A.. - In such a situation, there was nothing left for us to do but to keep a cool head and choose the direction and altitude of the flight to avoid a potential collision. We were not sure if the pilot even saw us and realised that something was still flying there. How can you be so irresponsible!

Marcin Klecz, while on duty, received a call from a firefighter drone pilot who was patrolling Lake Nysa. He was hovering there at 40 m AGL when he suddenly heard two Black Hawk helicopters and one Mi-17 coming in below 120 m. Neither the police aviation coordinator nor Flightradar knew about them. They were military machines.

– I think that if the State Fire Service is the lead service during an incident and takes on the management of the airspace, then every other state service, including the military, must respect this, not to mention civilians. This needs to be worked out - says Marcin Klecz.

Officially, GA pilots are not required to establish radio communications with FIS in Class G space, i.e. from 0 metres AMSL to 2,900 metres AMSL (i.e. above mean sea level). Yes, FIS asks and encourages them to engage in communication, or at least to keep a listening post, but the 'sky cowboys' often have little regard for aviation customs and safety. Then they are surprised and angry that some flying robots have crossed their path. This information imbalance must finally come to an end.

What is lacking here is political courage on the part of EASA (the European Union's aviation safety agency), which imposes extreme requirements on drone flights but is unwilling to force GA pilots to use transponders, let alone the obligation to maintain radio communication with FIS.

– Worse still, the need for right of usage of a two-way airborne radio by drone pilots is not understood by the Office of Electronic Communications (UKE) - laments Marcin Klecz (vide 'Connectivity for drones').

What can be seen from space?

- I want to make decisions with up-to-date and reliable data. During a flood in the Czech Republic in 2002, I had to walk around the flooded area myself.. It took me almost five hours. However, in September in Głuchołazy I was able to use satellite imagery delivered by the Crisis Information Centre of the Space Research Centre of the Polish Academy of Sciences and, above all, drone flights over flooded areas. This dramatically accelerated the delivery assistance - explains Jan Ziobro, Deputy Director of the Department of Security and Crisis Management of the Podkarpackie Voivodeship Office in Rzeszów, who was delegated to support the flood relief operation in Lower Silesia.

- Every drone footage recorded, every geo-information analysis improved our awareness and agility in decision-making - he adds.

Cleaning up the bed of the Biała Głuchołaska near the damaged bridge

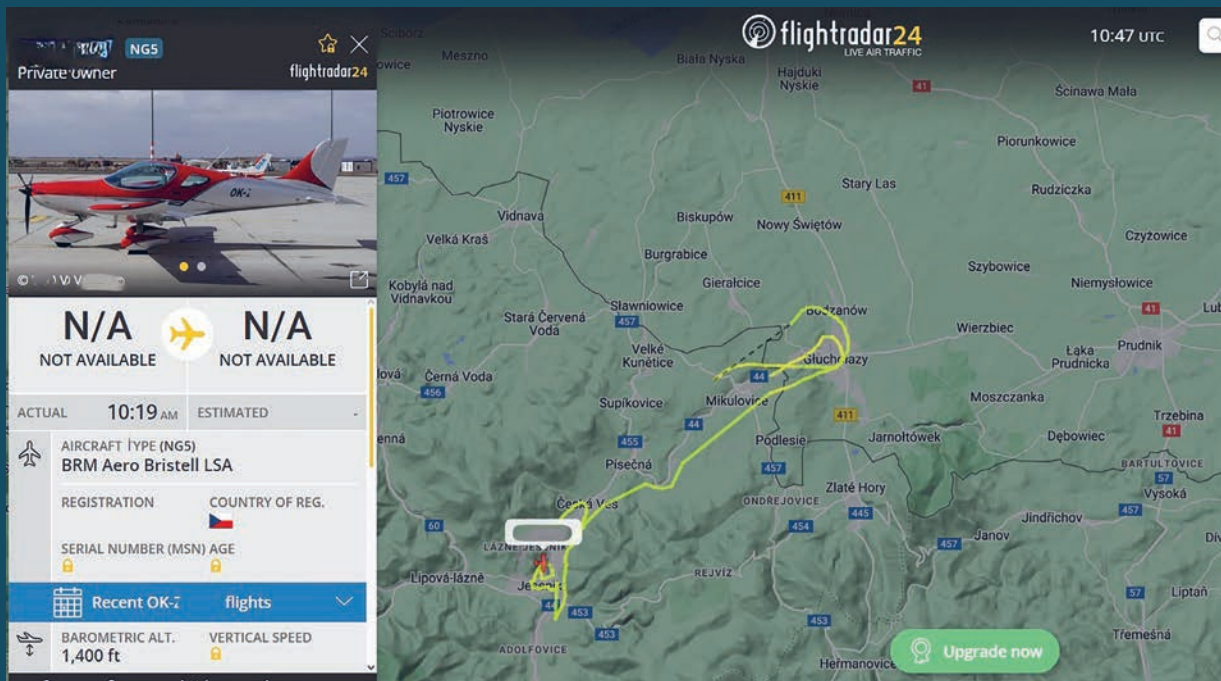
Photo: K. Lieder and R. Węsierski

This included flanking around the sewer or patrolling the riverbed. And it deposited gigantic masses of sand in places where it had never been

Photo: K. Lieder and R. Węsierski

Then, all of a sudden, while we were conducting a mission, out of nowhere, a Czech BRM Aero Bristell low-wing aircraft appeared. I could apparently see it in Flightradar, but its transponder kept losing range. He twisted is over Głuchołazy and went back to his place after a while, unaware of how many "polite verbal bundles" he received.

Photo by R. Węsierski



Once the water started to recede, the estimation of the damage began. - For this, we used various types of background vector data such as build-up, address, how many people lived there, and finally where there were historic buildings, roads or bridges. This was overlaid with up-to-date satellite imagery. In this way, we radically accelerated the granting of compensation. It was enough to check the address of the applicant, whether his property was under water - Krzysztof Kuriata, Director of the Department of Security and Crisis Management at the Warmińsko-Mazurskie Voivodeship Office in Olsztyn, who supported the action in Kotlina Kłodzka, praises such geo-information support.

- The better and quicker the data acquired, the greater the saving of forces and resources. After all, I used to have to approve or review several hundred decisions a day. A glance at the image from a drone or from a satellite significantly facilitated and accelerated the decision-making process - he explains. Every day, a different team of building inspectors arrived, who had to make a preliminary assessment of the condition of the buildings: whether they were fit for habitation, needed major renovation or would not do without demolition. If they had used an excel table, it would have dragged on forever. - And instead they got the photomap from us, on which to mark the damage - points out Krzysztof Kuriata.

Investing in the future

So what should information circulation look like in the future during a crisis situation? Satellite imagery would be the basis for large areas. A single system at the level of the National Co-ordination Centre for Rescue and Civil Protection at the National Headquarters of the State Fire Service would receive imagery from drones from different altitudes. Depending on their needs, the command centre and analysts in the field would be able to refer to the different information layers and compare changes. The more firefighting and other drones, as well as satellite systems and additional information sources are available, the greater is the need for a unified system. This is worth and needs to be invested in

Connectivity for the drones

The use of any radio equipment, either transmitting or receiving, in the aeronautical radio communication service (including portable radio), requires a radio licence on the basis of a radio equipment operator's certificate obtained. Such permit is granted by the President of UKE.
But the current regulations only distinguish between airborne and airborne (ground) stations. And what would be the call sign, identical to the aircraft call sign, in the case of drones? A new category for aerial robotics operators and pilots is missing. Perhaps it would suffice to consider the drone pilot and his radio device to be identical to an airport station, only with mobile status. In the current legal order, the location of aerial ground equipment outside an airport is determined by an address or geographical coordinates. This could be sufficient if it were not for the fact that the drone pilot sometimes changes his position every half hour.

Drones in flood relief

DJI MINI 3 PRO

It features an extended range of intelligent functions, video transmission and imaging and sensor systems. It weighs 249 grams. Operating time is up to 34 minutes. The Mini 3 Pro is also equipped with support for 3-way obstacle detection and enhanced APAS 4.0 (Advanced Pilot Assistance Systems). It allows stable live video transmission from up to 8 km away Its speed in windless conditions reaches 21.6 km/h.

Tasks during floods

- Depicting the tactical situation
- Photo and video documentation

Users during the action

- National Fire Service
- Volunteer fire brigade

Manufacturer

- DJI, China

DJI AIR 2S

The DJI Air 2S is a portable drone that can take on more advanced missions thanks to its foldable design and weight of around 600g. It stands out with its large 1″ sensor, which provides excellent quality shots. It records 5.4K/30FPS videos and takes 20 MP photos. While quadruple-round obstacle detection and the advanced AirSense system allow you to focus on the task. The DJI Air 2S also has a built-in AirSense system that provides information about nearby helicopters and aircraft. It receives the ADS-B signals they transmit and, based on this, marks their locations on a map. It also sends visual and audible warnings in the DJI Fly app.

Tasks during floods

- Depicting the tactical situation
- Photo and video documentation
- Online video coverage of hotspots

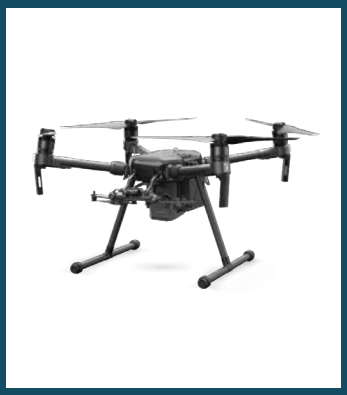
Users during the action

- National Fire Service
- Volunteer fire brigade

Manufacturer

- DJI, China

DJI Matrice 200



It is a professional industrial model that is suitable for inspections, , prospecting and orthophotos, among other applications. The brushless motors have been optimised for use with the 17-inch propellers, ensuring flight stability, even in strong winds. Power is supplied by two rechargeable batteries, which additionally heat the cell targets during low-temperature flight. The closed, sealed design provides resistance to rain and dirt (IP - 43), so that it can be flown even in very difficult weather conditions. Max. take-off weight: 6.14 kg.

Tasks during floods

- Site mapping
- Low-level photogrammetry
- Online video streaming
- Photo and video documentation

Users during the action

- National Fire Service
- Volunteer fire brigade
- Police

Manufacturer

- DJI, China

“Fly to Rescue” Tournament for the Chief Commandant’s Cup

Whoever is quicker to find the images of the people or objects hidden in the buckets, that one wins and moves on to the next round of the competition.

We would like to invite you to take part in the ‚Fly to Rescue’ tournament for the Chief Fire Officer’s Cup from 5 to 7 June 2025 (Thursday - Saturday) at the Gli- wice-EPGL airfield during the XII Droniada GZM (droniada.eu).
We will set up three parallel tracks there. They are each 30 m long and 10 m wide at 10 m intervals. We set up 25 buckets on each track. They can be hidden in barrels, stand on scaffolding or on wooden stands. Into the buckets we place 10 pictures/objects to be found and 15 not to be searched for.

- In Thursday’s preliminaries, 32 athletes will advance to Friday’s round based on their score.
- After Friday’s flights, 16 pilots will be eligible to compete in Saturday’s quarter-finals.
- In the semi-finals, the eight contestants with the best results in terms of correct recognition of the hidden objects and time achieved will meet.
- In the semi-finals and finals, the better of the pair wins. Who will be the champion? Who will win the State Fire Service Commander’s Cup?
- In the preliminaries, the photos shown are identical to those hidden in the bucket. In the semi-finals and finals, on the other hand, the photos differ in shot, e.g. a person is shown in a formal photo, while in the bucket we hide a photo of them in the field along with a brief description of their clothes, for example.

Registration of competitors via droniada.eu. Participation in this competition is free of charge. It is worth taking part!

Fly to rescue 2024.
Lt. mar. Lukasz Grzyb from the Naval Academy in Gdynia takes off.

DJI MATRICE 350 RTK

The Matrice 350 allows the use of a completely new video transmission system and more powerful batteries. Flight time is up to 55 minutes. In addition, the new DJI O3 En- terprise Transmission feature gives users the option of three-channel live video transmission over a distance of 20 km. The Matrice 350 RTK drone's IP rating has been raised from IP45 to IP55, allowing it to fly in heavy rain. In addition, the FPV camera has been upgraded to improve navigation and increase flight safety in poorer light conditions.

Tasks during floods

- Site mapping
- Low-level photogrammetry
- Online video streaming
- Photo and video documentation

Users during the action

- National Fire Service
- Volunteer fire brigade
- Police

Manufacturer

- DJI, China

FLYEYE UNMANNED AERIAL SYSTEM

The FlyEye multi-purpose unmanned aerial system is an advanced, entirely Polish solution. The combat-proven BSP can be used for battlefield surveillance, artillery guidance, signal retransmission, border patrol or critical infra-structure monitoring.

FlyEye's modular design allows the unmanned aircraft to be prepared for take-off and assembled after landing in less than ten minutes. The take-off itself takes place automatically, the BSP being released ‚from the hand' of the operator. FlyEye is characterised by a very low logistical burden on the operator. No support equipment in the form of a launch pad or pneumatic catapult is required for take-off. Landing can take place on any terrain. This significantly reduces the weight of the transported kit. The take-off of the BSP FlyEye can be carried out from a free space, even from the deck of a small vessel.

Tasks during floods

- Operational imaging
- Online video streaming
- Photo and video documentation

Users during the action

- Territorial Defence Forces
- Flytronic S.A. drone team.

Manufacturer

- Flytronic S.A., Poland

BAYRAKTAR TB2

The Bayraktar TB2 is a tactical unmanned reconnaissance and strike system (BSR-U), capable of conducting observation and reconnaissance (ISR) and combat missions using laser-guided weaponry carried on four under-wing suspension points. The Bayraktar TB2 is equipped with an avionics system enabling fully automatic taxiing, take-off, overflight and landing. The drone is 6.5 metres long and has a span of 12 metres. It achieves a flight duration of up to 27 hours. The drone has a take-off weight of 650 kilograms and a maximum speed of approximately 220 km/h.

Tasks during floods

- Operational and strategic imaging
- Online video streaming
- Monitoring at night

Users during the action

- 12 Base of Unmanned Aircraft in Mirosławiec

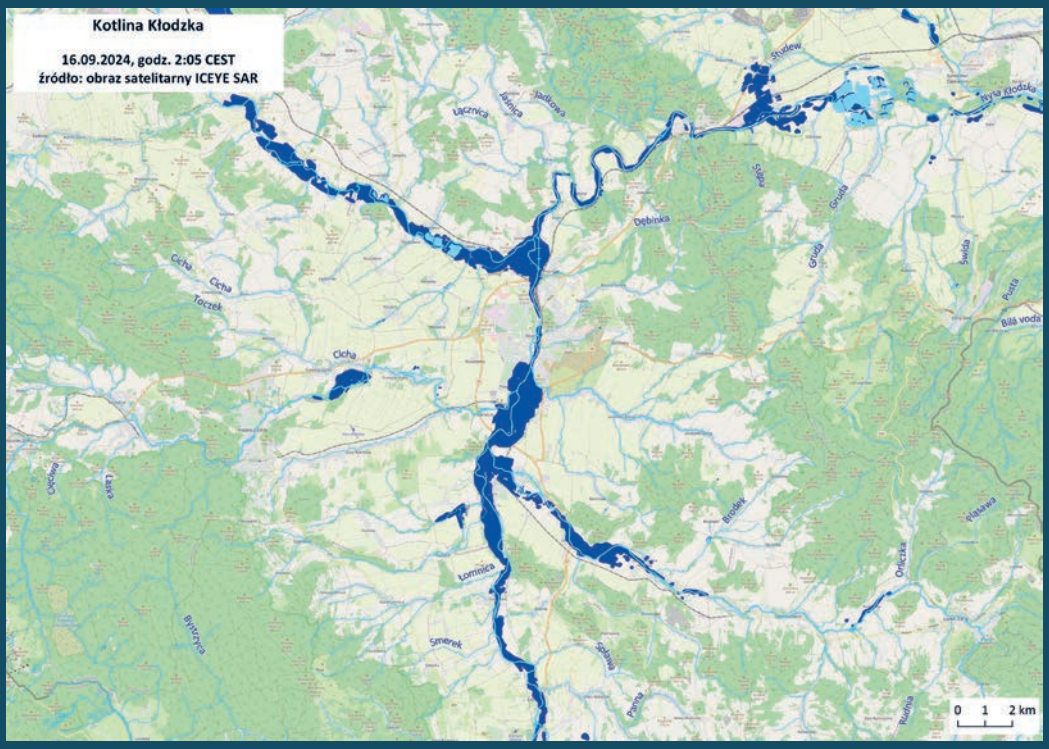
Manufacturer

- Baykar Makina Sanayi ve Ticaret A.S., Turkey

Geoinformation analyses

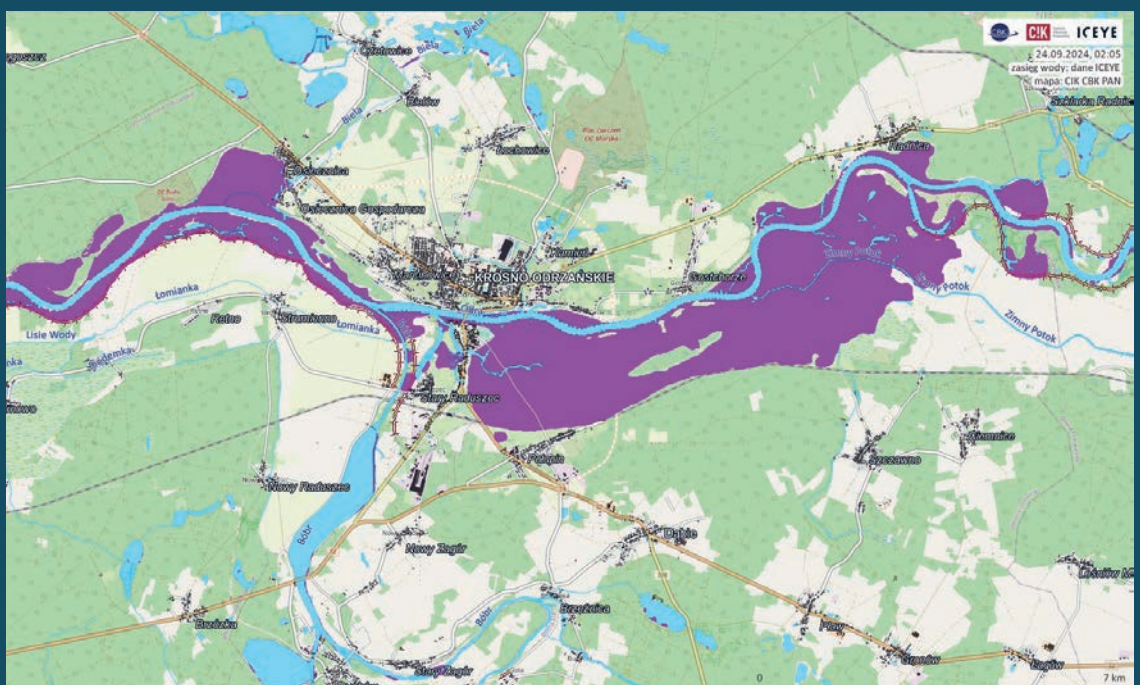
Since the beginning of the flooding in Poland, i.e. 13 September, the Crisis Information Centre had been on 24/7 duty
CBK PAN provided the services involved in the flood response with information on the current extent of the flood water.
This was possible primarily thanks to the satellite radar data produced every six hours by ICEYE, as well as the optical satellite data made available for emergency management purposes by the Geospatial Reconnaissance and Satellite Services Agency of the Polish Armed Forces (Pléiades Neo) and Planet Labs (PlanetScope, SkySat).
Based on up-to-date satellite data, CIK CBK PAN also met other current needs of crisis management centres and State Fire Service by performing geo-information analyses of, among other things, changes in the course of the river bed, the location and number of flooded buildings (addresses) in individual municipalities, visualising the damage. The IMGW-PIB also joined the effort by providing analyses of the drainage areas.

Water coverage in the Kłodzko Basin on 16 September at 2am. Satellitesradars do not need sunlight to acquire images.

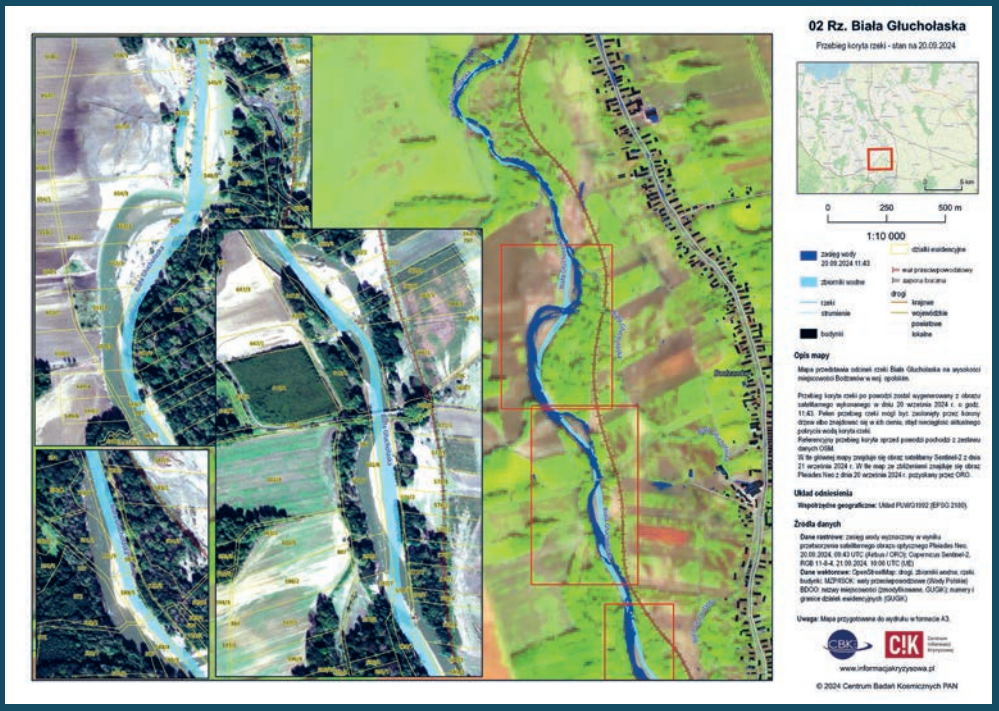


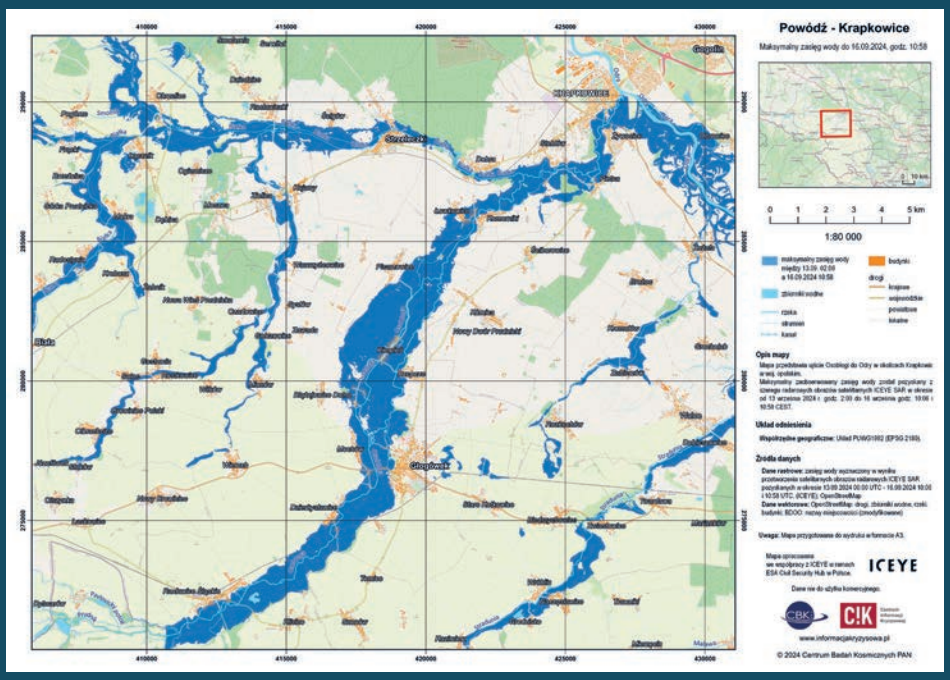
Flooded areas in the lower section of the Nysa Klodzka River on 21.09.2024 on Sentinel-2 satellite imagery (Copernicus/EO Browser).

CIK CBK PAN based on the Rapid Flood Insight product using radar satellite imagery from ICEYE.



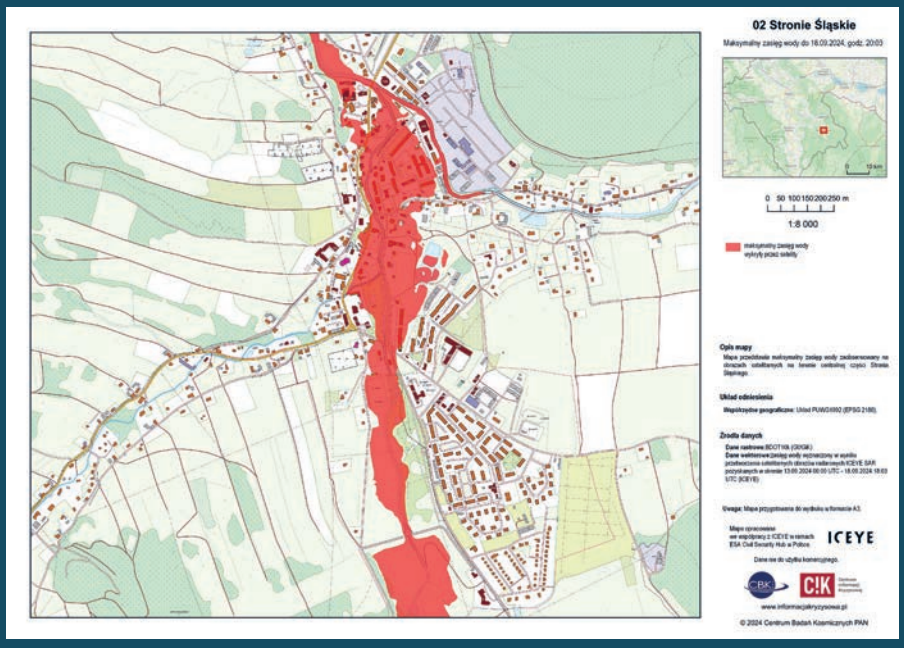
Analysis of the change in course of the Biała Głuchołaska river for the needs of the crisis staff in Głuchołazy.





Flooded river valleys in the Opolskie Voivodeship. The maximum water extent observedon ICEYE satellite images acquired 13 to 16 September.

One of the maps produced for the headquarters of the Stronie Śląskie / Lądek Zdrój municipality showing the maximum extent of water detected by radar satellites.
In densely built-up areas, it is not always possible to detect the entire flooded area.



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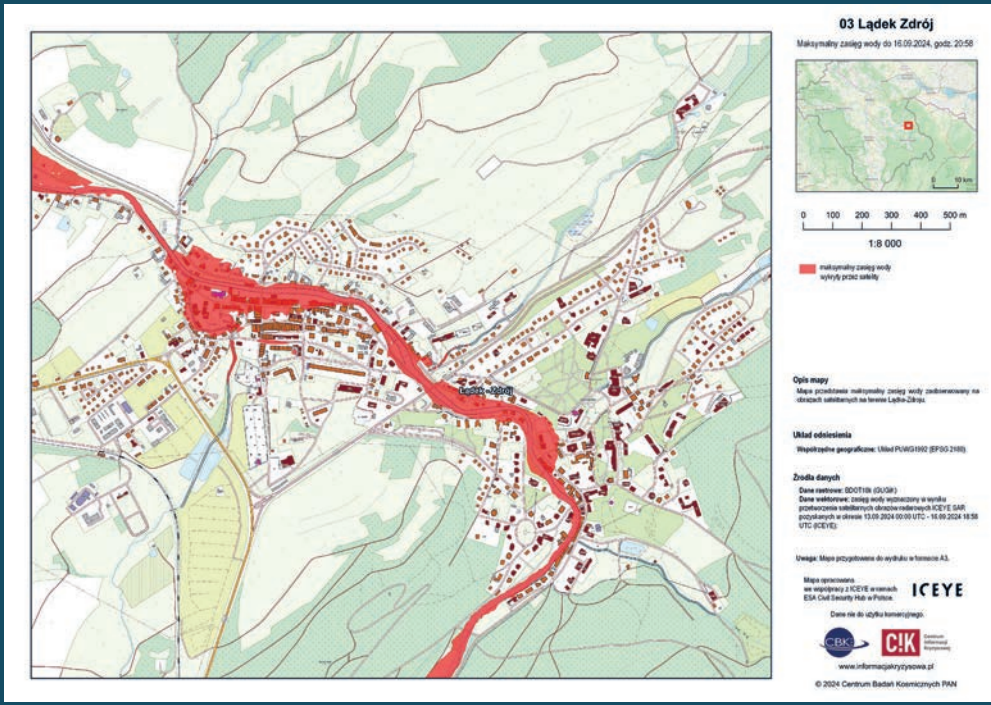
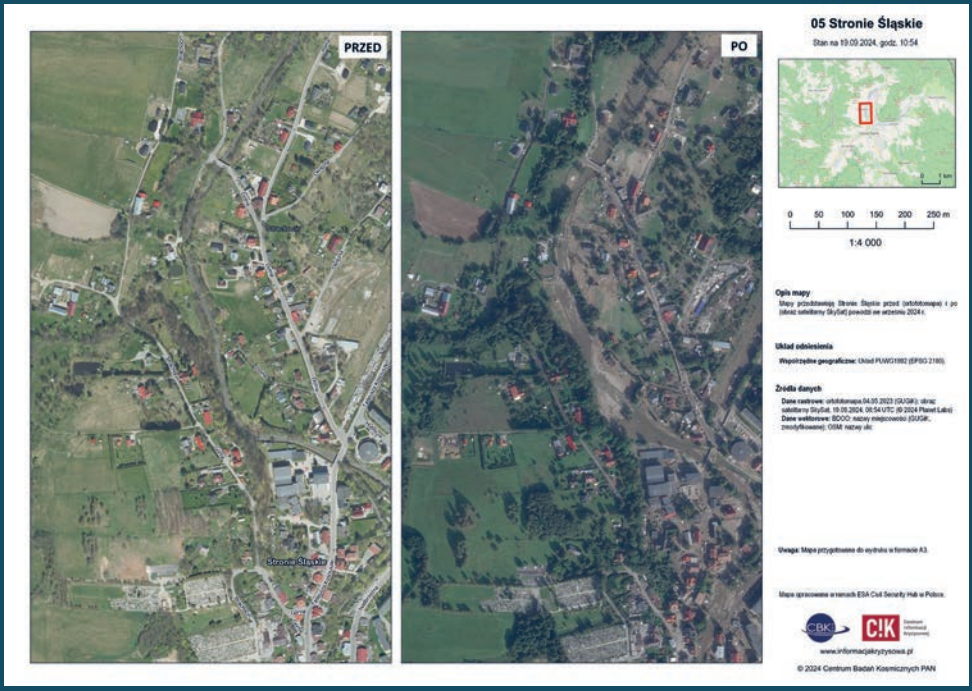
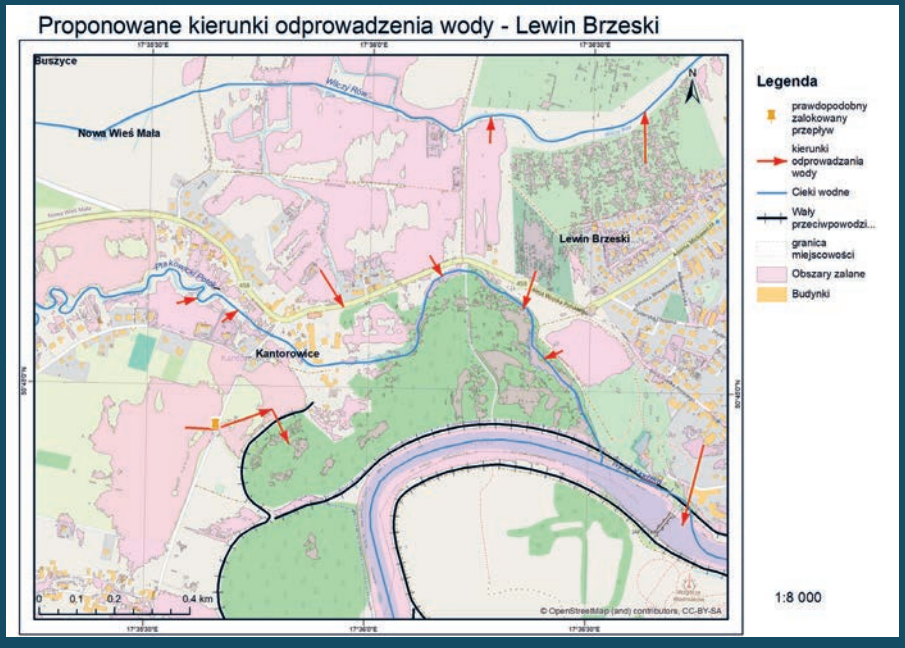




Comparison of site condition before (aerial orthophotomap) and after (SkySat satellite image provided by thePlanet Labs) the passage of the flood wave in Stronie Śląskie.

Recommendation of discharge directions water from Levin area Brest (compiled by IMGW-PIB on the basis of Pléiades Neo satellite images).



Drone analysis

Images by Maciej Górski with the cooperation of the TPI Technical Support Department including Artur Malczewski..

GŁUCHOŁAZY after the passage of the flood wave. First 2D imaging for SD/SK and gain situational awareness of emergency manager in the crisis area. Up-to-date mapping of damaged infrastructure for site reconnaissance and decision-making on the sequence and type of action to be taken.
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DEADLINE. A measurable 3D model of urbanised infrastructure.Used for initial assessment of road passability for delivery of aid to those in needand forward-looking planning of subsequent rescue and reconstruction activities.

Water sill/jam on the Głuchołaska Biała River. Measurable 3D model created after the passage of a destructive flood wave. Made via BSP due the very difficult access to the site by land. At the same time, the model allows a numerical and quantitative assessment of the restoration of access roads to the site. In addition, it provides information on the amount of loose material needed to restore the river to its natural channel.

Dam on the Morawka River in the town of STRONIE ŚLĄSKIE. 8 min BSP DJI Mavic 3t raid with 8 ha coverage. Raid carried out to acquire a measurable 3D model to undertake a volume assessment the cavity created in the earth section of the dam embankment.

A model of the civil engineering structure, temporary bridge DMS - 65, built on the site of a destroyed bridge crossing. The cyclic raid of the BSP acquiring imagery for 3D modelling of the object allows for precise and continuous surveillance by the owner of the structure of its technical condition. At high rates implementation of a temporary structure in a post-flood area, it can be assumed that a selected part of the structure may be subject to unforeseen deformation. Dangerous deformations can be diagnosed by comparing several consecutive images.

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Partners in the CoSky Initiative - Space Research Centre of the Polish Academy of Sciences (CBK PAN),
Norwegian Directorate of Civil Protection (DSB) and
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Photo Flytronic S.A.