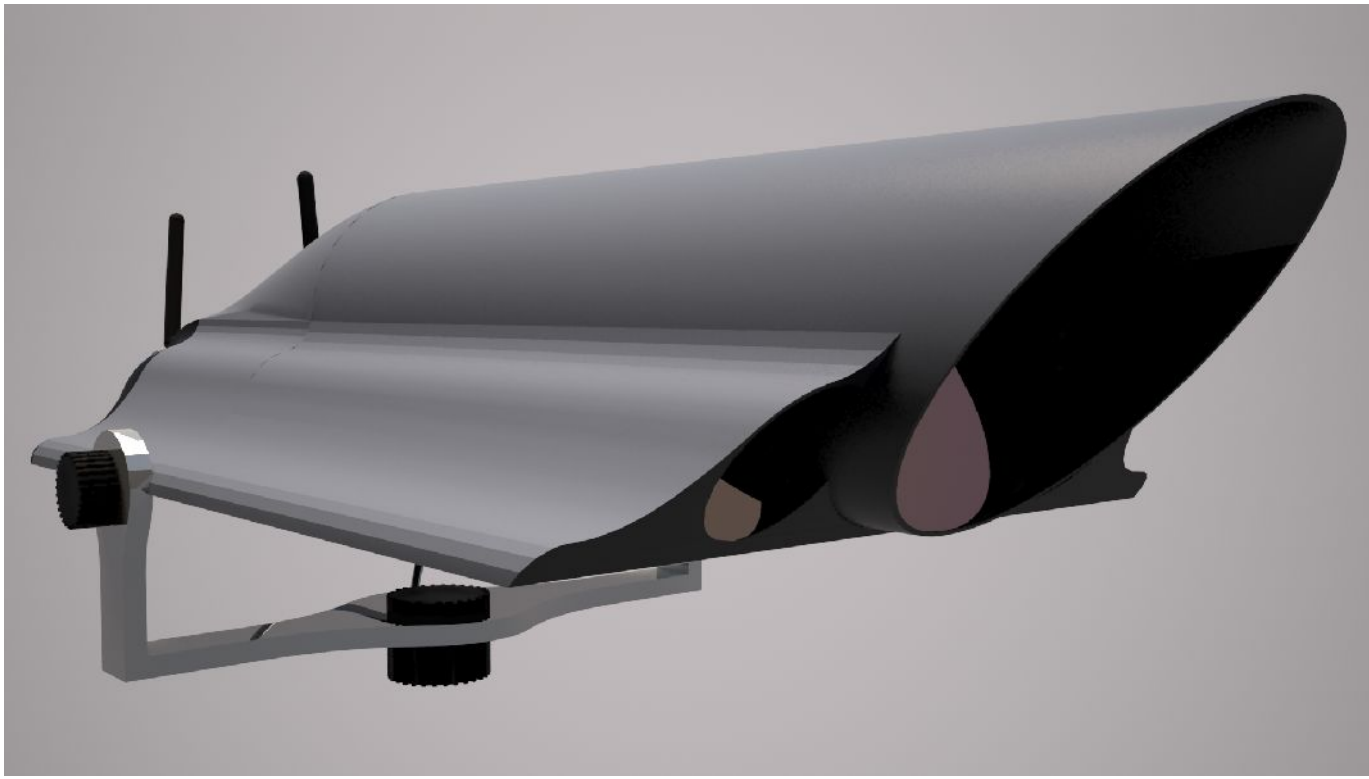
AUTOMATIC FAST FOREST FIRE DETECTION SYSTEM

@wf®

@integra wildfire



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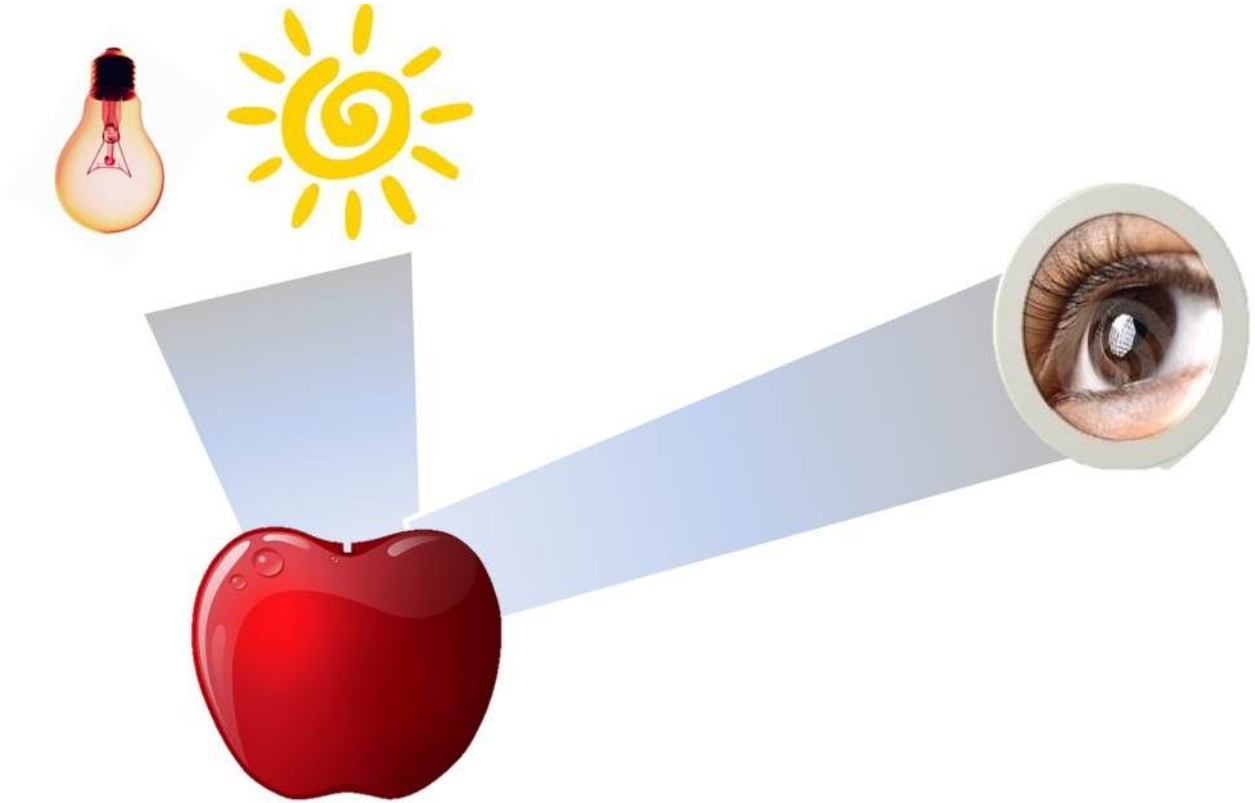
1. The idea behind @wf® (I)

The R+D department at *@integra group* is developing a new product that represents a unique approach to the detection of forest fires at a very early stage.

The idea behind the @wf® is the mechanism used by the human eye. In normal conditions, we see objects because they are iluminated by light (sunlight or artificial light). The engineers and technicians at *@integra* started to develop the system from that simple idea.

1. The idea behind @wf® (II)

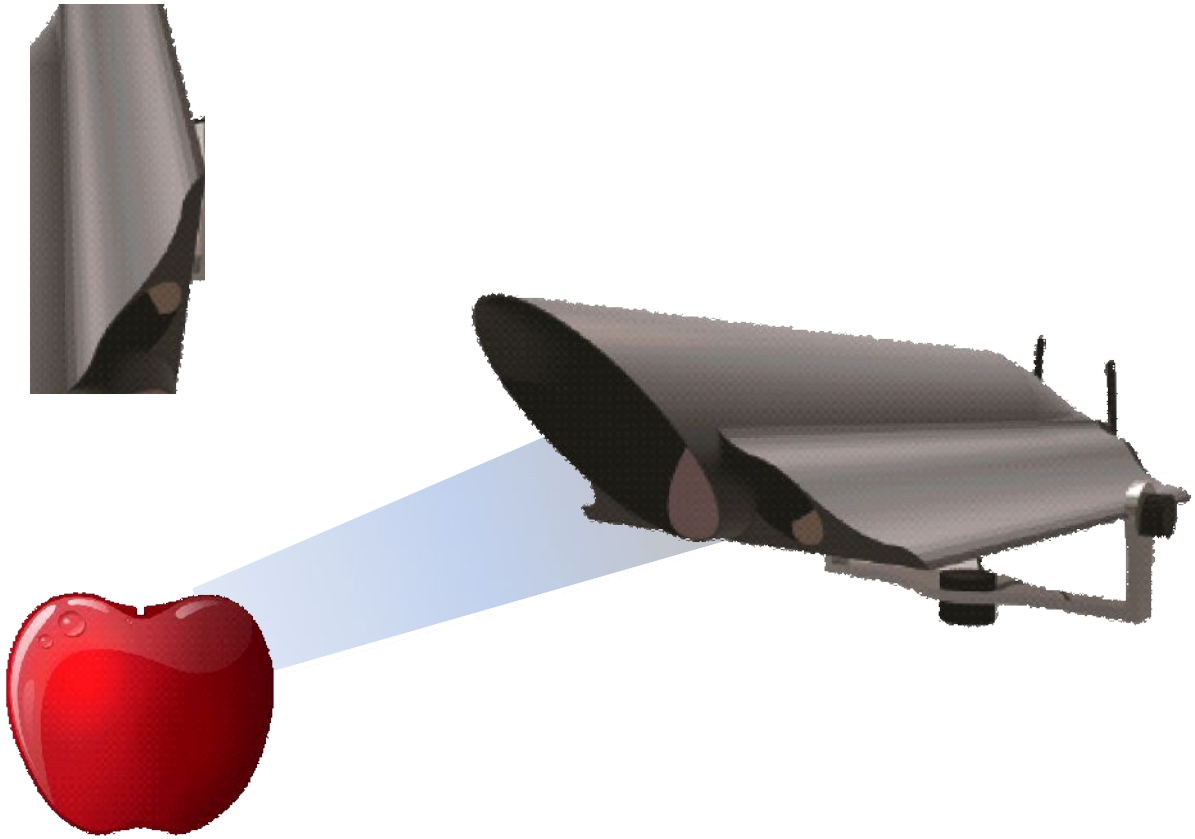
The human eye can see objects because of the light reflected onto it, whether it is from the sun or artificial light. That was the basis for the development of @wf®



1. The idea behind @wf® (III)

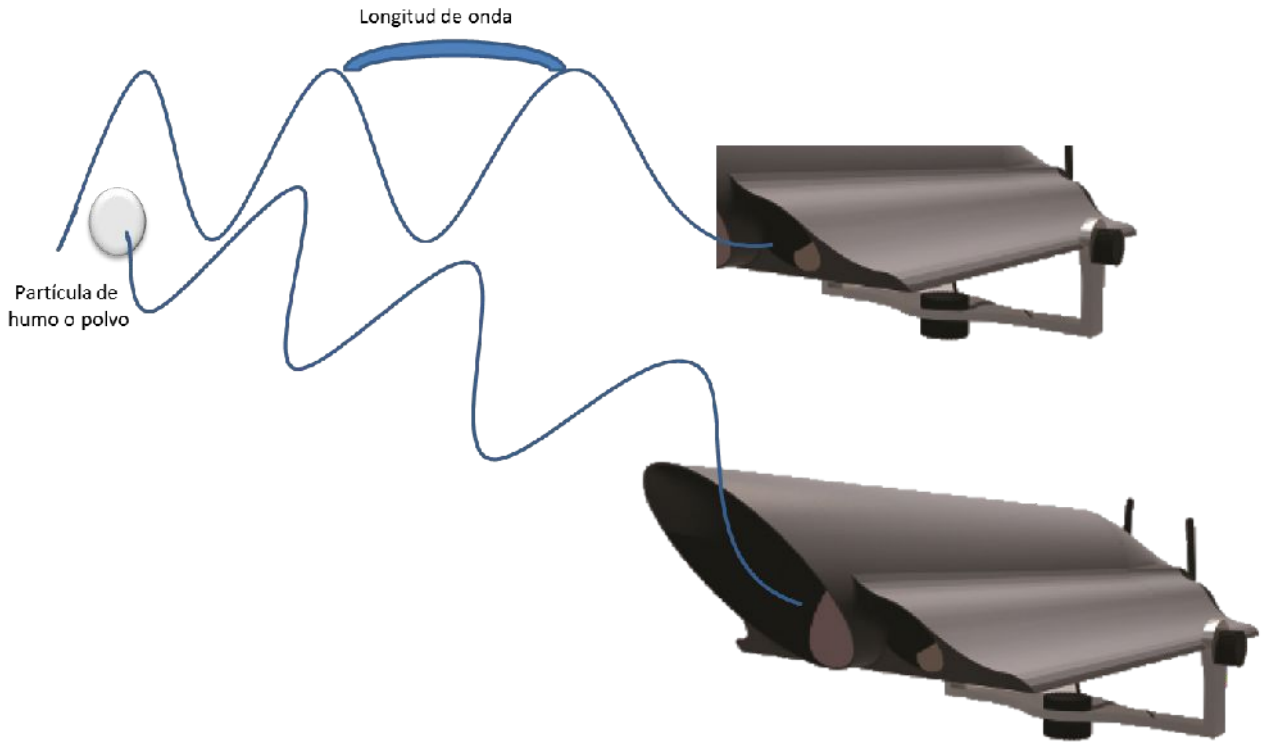
The mechanism used by *@integra* is exactly the same as that of the human eye.

An emitter send a modulated infrared beam, with special characteristics known to the system, and when it hits a solid object that scatters light, that light will be picked up by the detector.



1. The idea behind @wf® (IV)

The emitter sends out a modulated infrared beam of a particular wavelenght. If the wavelenght is much greater than the size of the particles of smoke or dust there would be no detection, if similar or smaller there would be detection.



1. The idea behind @wf® (V)

The image on the right shows how the system works. The beam is sent over the dotted line on the horizon. If the beam does not hit anything it will vanish over the horizon.

1. The idea behind @wf® (VI)

When the infrarred modulated beam hits an object, for instance a column of smoke, the scattered light will be picked up by the detector.

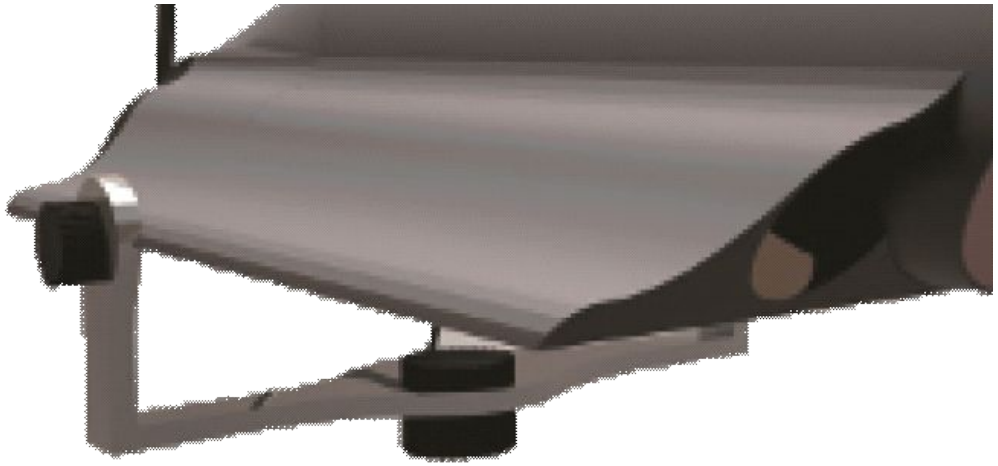
1. The idea behind @wf®(and VII)

The most important features of @wf® are the capability to detect forest fires, and the emission of atmospheric contaminants at a very early stage (in the case of forest fires even when there is no open flame), and the ability to reduce false alarms.

2. @wf® components (I)

EMITTER

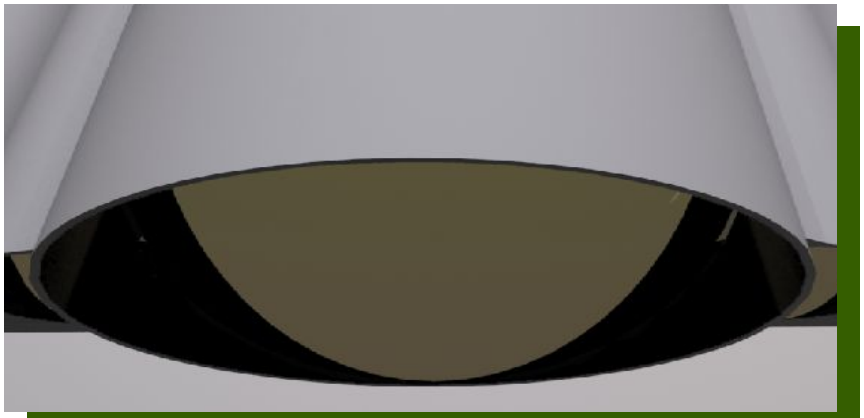
The emitter generates the infrared modulated beam with a code which is predetermined. The signal is transmitted continuously and is monitored to ensure power levels are maintained and that there really is a signal.



Detail of emitter in the structure of the system.

2. @wf® components (II)

DETECTOR

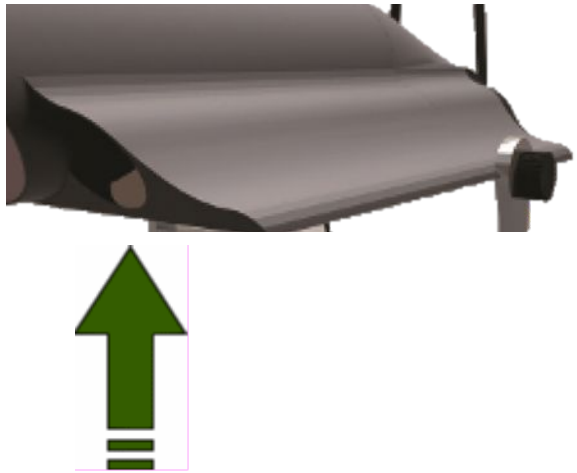


Front view of the detector

The detector consists of a big optical lens capable of detecting very small fractions of the beam.

2. @wf® components (III)

CAMERA



View of the camera inside the case of the system.

The camera is used when the system has detected scattered light coming from the collision of the infrared modulated beam sent out by the emitter with any object above the horizon line, after a double check by the system.

2. @wf® components (IV)

Power Supply

The power supply is located below the tripod legs and is the source of power to ensure the system works properly.

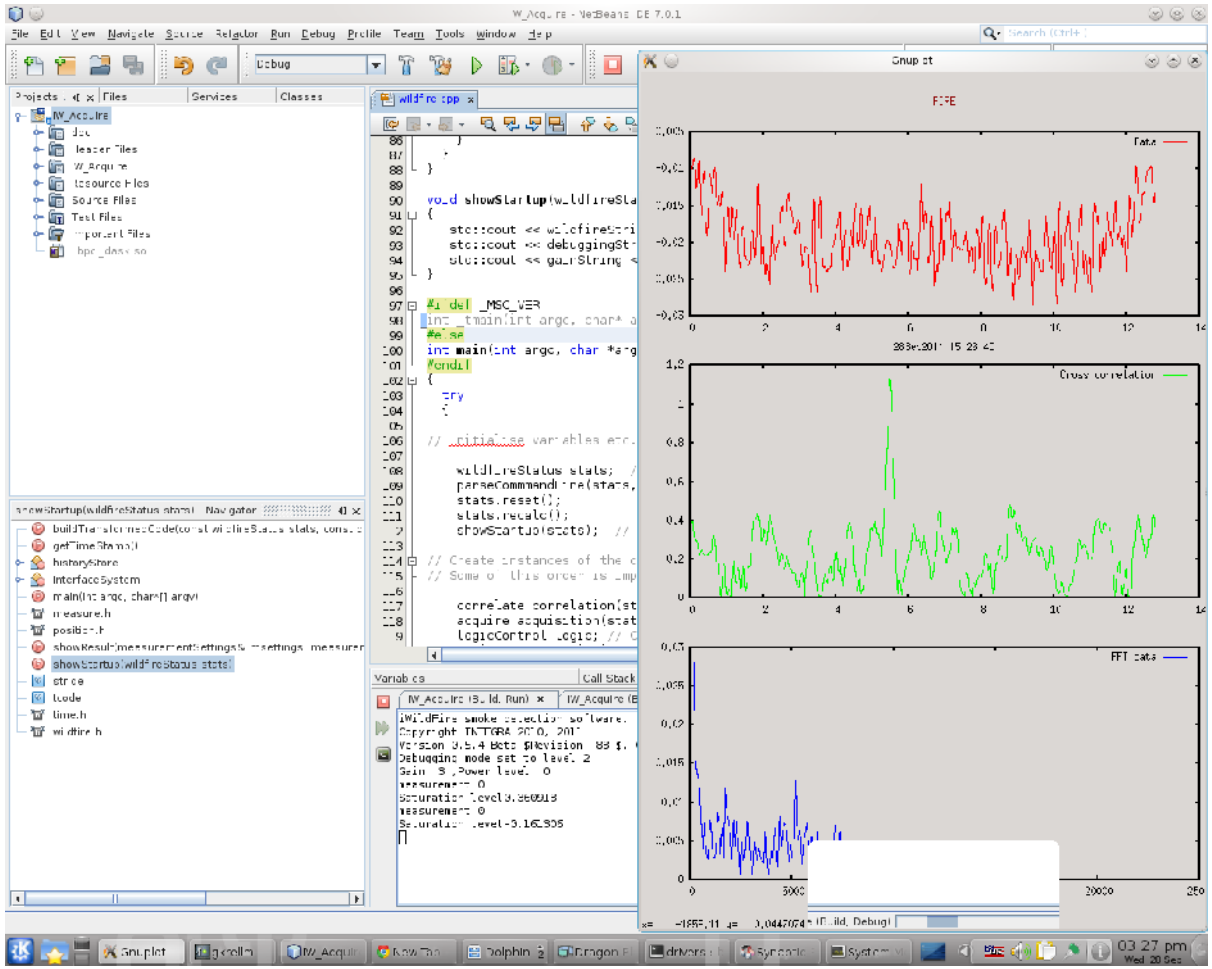
The final system will have a solar panel with an electronic controller and batteries.

2. @wf® components (V)

SOFTWARE

The software detects the signals that indicate a fire.

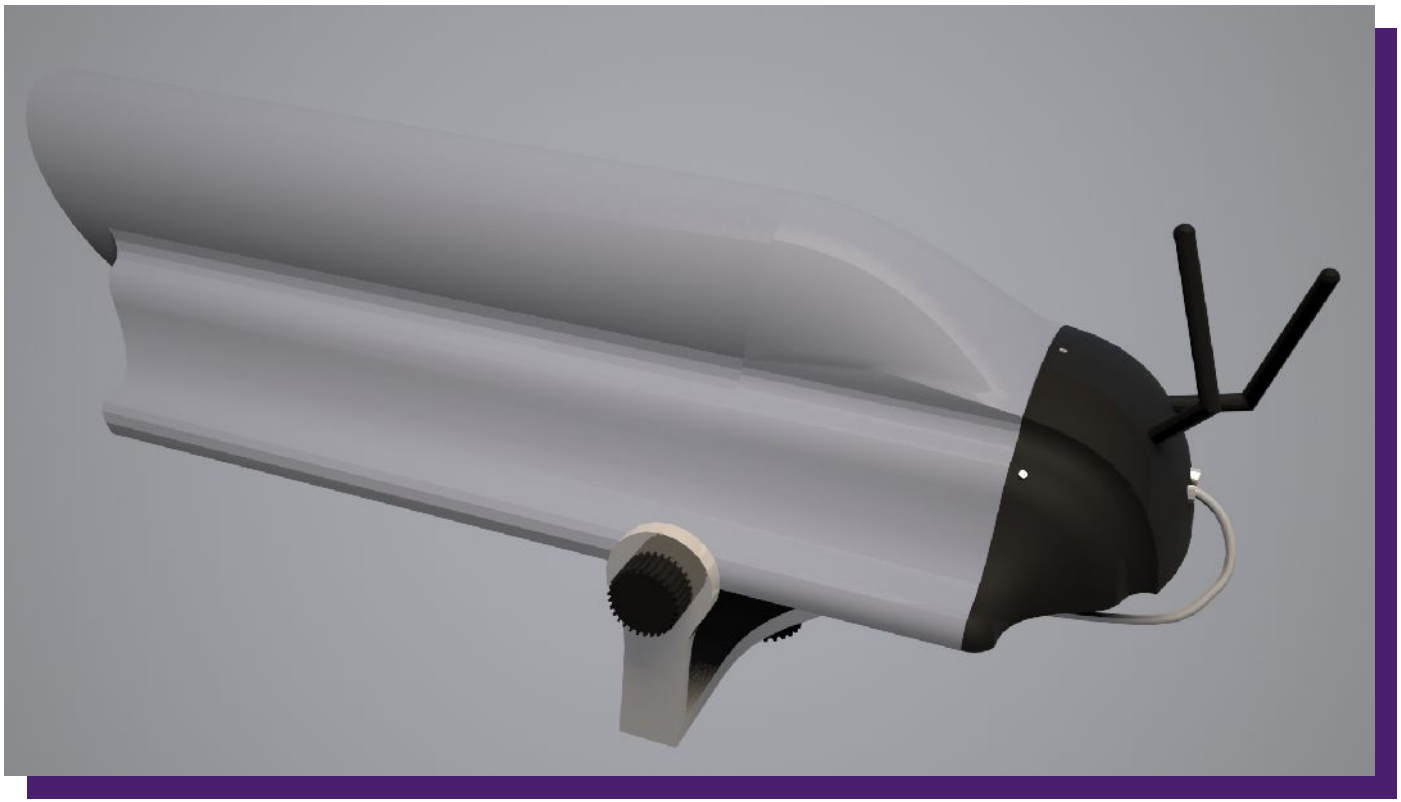
The system will capture an image of the point from which the signal comes, and will send the information to a central control point, where a final decision is expected to be made by a human operator.



2. @wf® components (and VI)

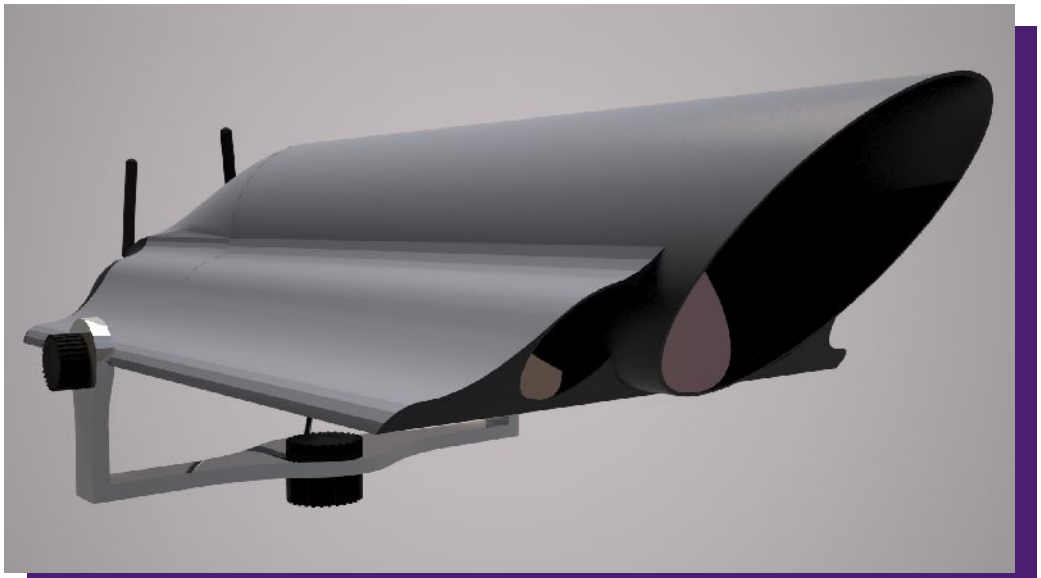
NEW!

@integra wildfire



3. Glossary (I)

Scanned area: Is the geographic zone swept by the system, where the infrared modulated beam could be scattered by smoke, dust clouds, or any other atmospheric emission, or lost over the horizon, and in wich it generates enough intensity to be detected by @wf®.



3. Glossary (II)

Target: Is the type of emission to be detected by the system. Usually it will be smoke produced by the combustion of forest biomass, but it can also be oil, smoke, dust, atmospheric contaminants, leakage of dangerous chemichals, etc. The target will be any type of material in the infrared beam path because it will cause backscattering of the beam sent out by @wf®.

3. Glossary (III)

Code: Is the sequence of bits that makes the signal emitted by the transmitter. The electromagnetic radiation carrying by the code can be polarized or not. The polarization of the emitted radiation may be horizontal, vertical, right circular or left circular.

Infrared Modulated Beam (IMB): Is the beam emitted by the system scanning the area under its influence. Its characteristics will be set according to the target to be detected (central frequency, bandwith, intensity, beam solid angle, polarization, and modulation (code and repetition rate).

3. Glossary (and IV)

Backscattering: Is the scattering that occurs in the same direction in wich the infrared beam is emitted, but backwards. The angle between incident ray and backscattered ray is 180º.

Central control: Is the place where all the warnings of forest fires or leakage of contaminants are received, and the point where all the decisions will have to be made after validation of the incident by a human operator. The central control manages the communication with all the units that make up the system.

4. Technical issues related to @wf® (I)

1. Field of vision (I)

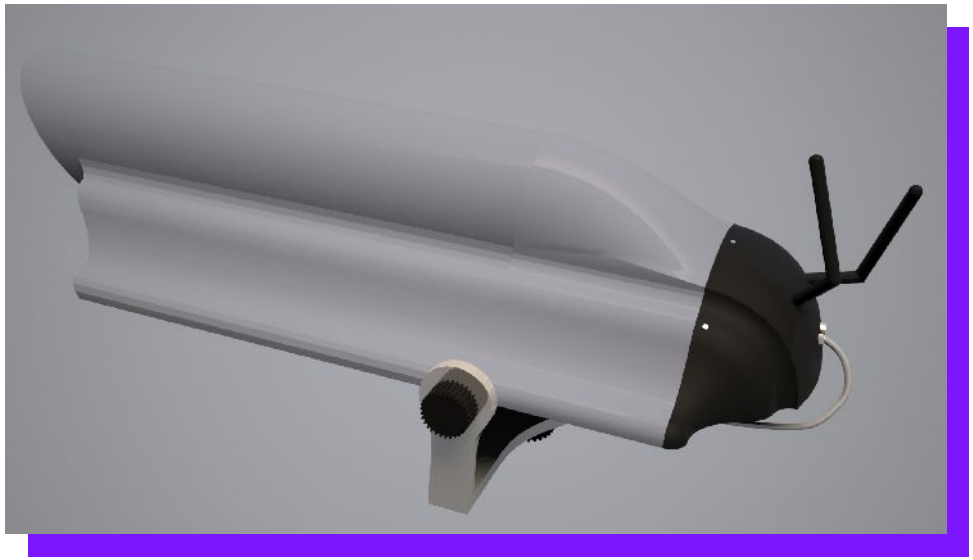
The system has been designed to send out the infrared modulated beam in steps to a certain angle until it covers the required zone, but it can be modified according to the geographic zone in which is set up, taking into account the area to be covered and the desired sensitivity.

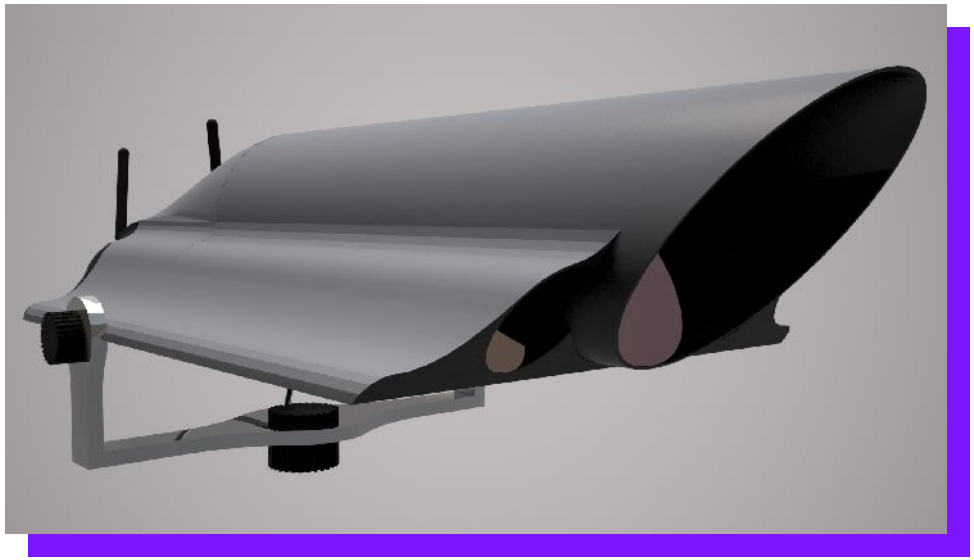
When the emitter sends out the infrared beam, the emitter and the detector have to be perfectly aligned. Performing that action continuously, the system covers the area under its influence 24/7.

4. Technical issues related to @wf® (II)

1. Field of vision (II)

The system is fully programmable according to the geographic zone to be covered, speeding up or slowing down the process to sweep 360º in more or less time, and even increase the sensitivity or the surface to cover.

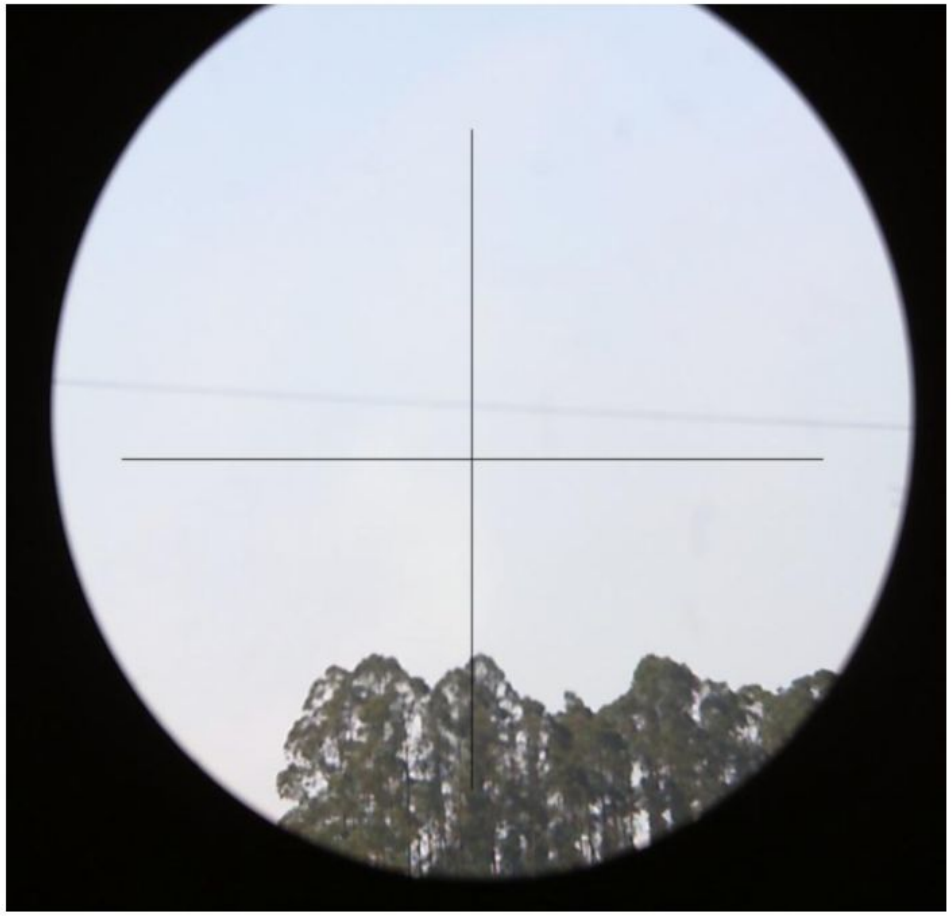




4. Technical issues related to @wf® (III)

1. Field of vision (and III)

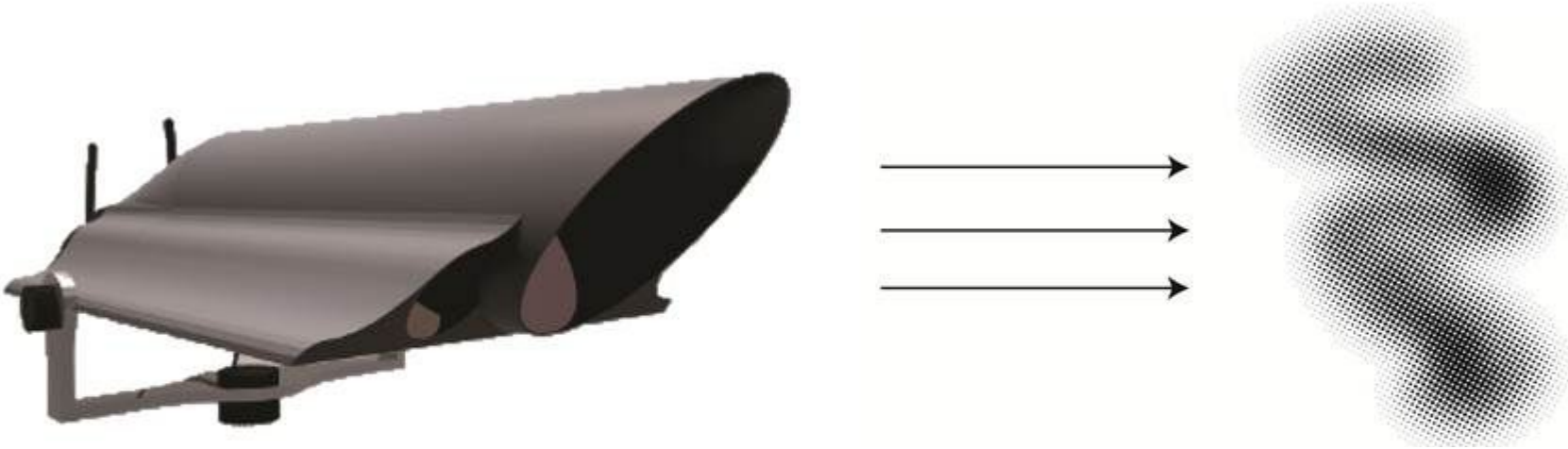
The picture shows an image taken by the @wf® camera in the forest. The measurements of the light are done for each movement the system does covering a certain number of degrees, but the camera has a much more wide view on purpose to improve the vision of the detected incidents.



4. Technical issues related to @wf® (IV)

2. Infrared modulated beam reception (I)

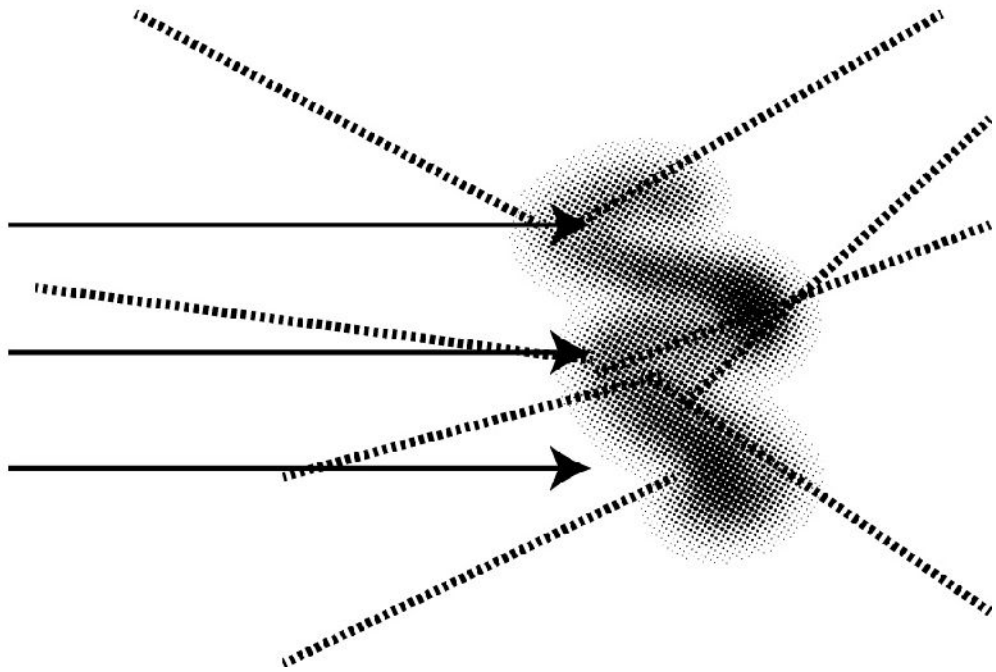
The system is sending the beam out continuously above the horizon line to pick up any of the beam that comes back to the emitter because of the scattered light produced when it hits a solid object (column of smoke, dust cloud, etc...).



4. Technical issues related to @wf® (V)

2. Infrared modulated beam reception (II)

One of the main factors for the detection of forest fires or atmospheric contaminants is the scattered light produce by the beam when it hits a solid object. When that happens there will be scattered light in all directions, included that of the detector.



4. Technical issues related to @wf® (VI)

2. Infrared modulated beam reception (and III)

As it is shown in the image on the right, the detector picks the scattered light up and then the system amplifies the signal to assess the existence of a forest fire or a false alarm.

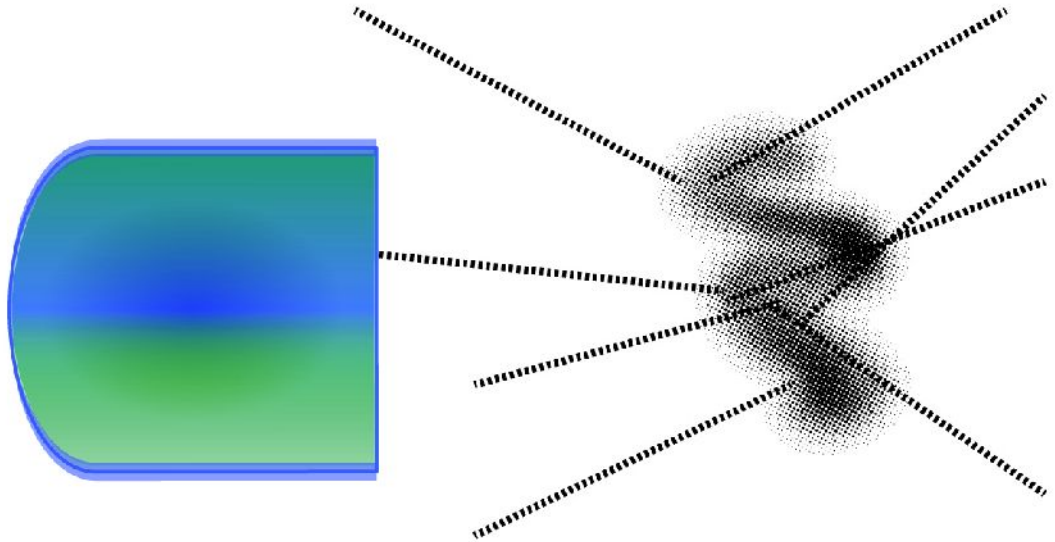


IMAGE OF THE RECEIVER PICKING UP SCATTERED LIGHT

5. Functioning of @wf® (I)

A detailed description of all the steps taken by the system to detect forest fires, or the emission of contaminants into the atmosphere will be shown in the following slides.

5. Functioning of @wf® (II)

1

The system has one or more emitters and one or more receivers (detectors) perfectly aligned. The emitter sends out the infrared modulated beam and the receivers pick up any of the beam that comes back because of smoke or any other emission in its path. The infrared modulated beam will be sent out above the horizon, according to the coordinates previously entered into its software and related to the area under its control (swept zone).

2

The emitter generates the infrared modulated beam with known characteristics (central frequency, bandwith, intensity, solid angle, polarization, modulation) and scans the area under its influence above the horizon line.

5. Functioning of @wf® (III)

3

The detector is designed to pick up the minute fractions of the infrared modulated beam scattered by the obstacles it finds above the horizon line (Targets). If it does not find any obstacles, the beam will be lost over the horizon. @wf® can complete a 360 degree sweep in less than 3 minutes.

4

When the infrared modulated beam hits an object above the horizon line (e.g. a column of smoke) it will be scattered in many directions due to the impact with the obstacle (Target).

5. Functioning of @wf® (and IV)

5

A detector unit picks up the fraction of the scattered beam. The mere detection of that fraction of light guarantees that something has appeared on the horizon and further analysis is require to define it.

6

The software can discriminate whether the obstacle that causes the scattered beam is a column of smoke or another element in its path (bird, fog...). It does so by double checking the same geographic point detected in the first place scanning that area sending out again an infrared modulated beam. If the detector finds that the scattered light is still present, it will take a picture of the source of the signal, and scan to determine its size. The data is then sent to the central control where a final decision on whether there is a forest fire, an atmospheric emission, any other incident or a false alarm will be made by a human operator.

6. Assessment of currently available systems (I)

Nowadays, apart from the traditional solution for forest fires, that means a person with binoculars watching the horizon, there are two systems to detect fires.

1.- System based on pictures. Different pictures of the same area are taken, and a software compare one to another so it can conclude the existence of fires.

2.- System based on infrared or thermal cameras. Fires can be detected based on the emission of heat by human beings or objects.

6. Assessment of currently available systems (II)

The system based on images takes two pictures of the same landscape and would conclude that in the first picture there is a column of smoke.

This system is not fast at all, so when the software concludes that there is a fire it would probably be too large to be put up easily.

6. Assessment of currently available systems (and III)

The system based on infrared or thermal imaging cameras can detect the existence of incidents based on the emission of heat by objects or its combustion.

This system would not detect any hot spot behind another object, and that point of heat has to be intense in order to be detected by the cameras, so when the system concludes the existence of a fire, the fire is already too large to be put up easily.

7. Main features of @wf® (I)

- @wf® generates and sends out its own infrared modulated beam with known characteristics.

- @wf® can detect minute fractions of the scattered beam due to a triple amplification (optical, electronic and algorithmic), which is why it can detect forest fires or contaminant escapes into the atmosphere at a very early stages.

- @wf® validation process reduces false positives.

- @wf® helps the decision making process by sending photos or video recordings of the detected area.

7. Main features of @wf® (and II)

- Each unit can cover up to 2.800 hectares and further units can be added to extend coverage.
- @wf® can operate on a 24/7 basis and its detection is enhanced in nighttime opertion.
- @wf® is autonomous and automatic, does not require continuous human intervention.
- The system only responds to its own emitted light.
- Remote control of the system from central control is also possible.

8. Possible uses (I)

- Forest fires.
- Chemical leaks, toxic leaks, atmospheric contaminants...
- Industrial emissions into the atmosphere (manufacturing warehouses, shipyards,emissions from industrial estates).
- Emmisions into the air by sawmills, feedmills...

THANK YOU VERY MUCH FOR YOUR ATTENTION

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