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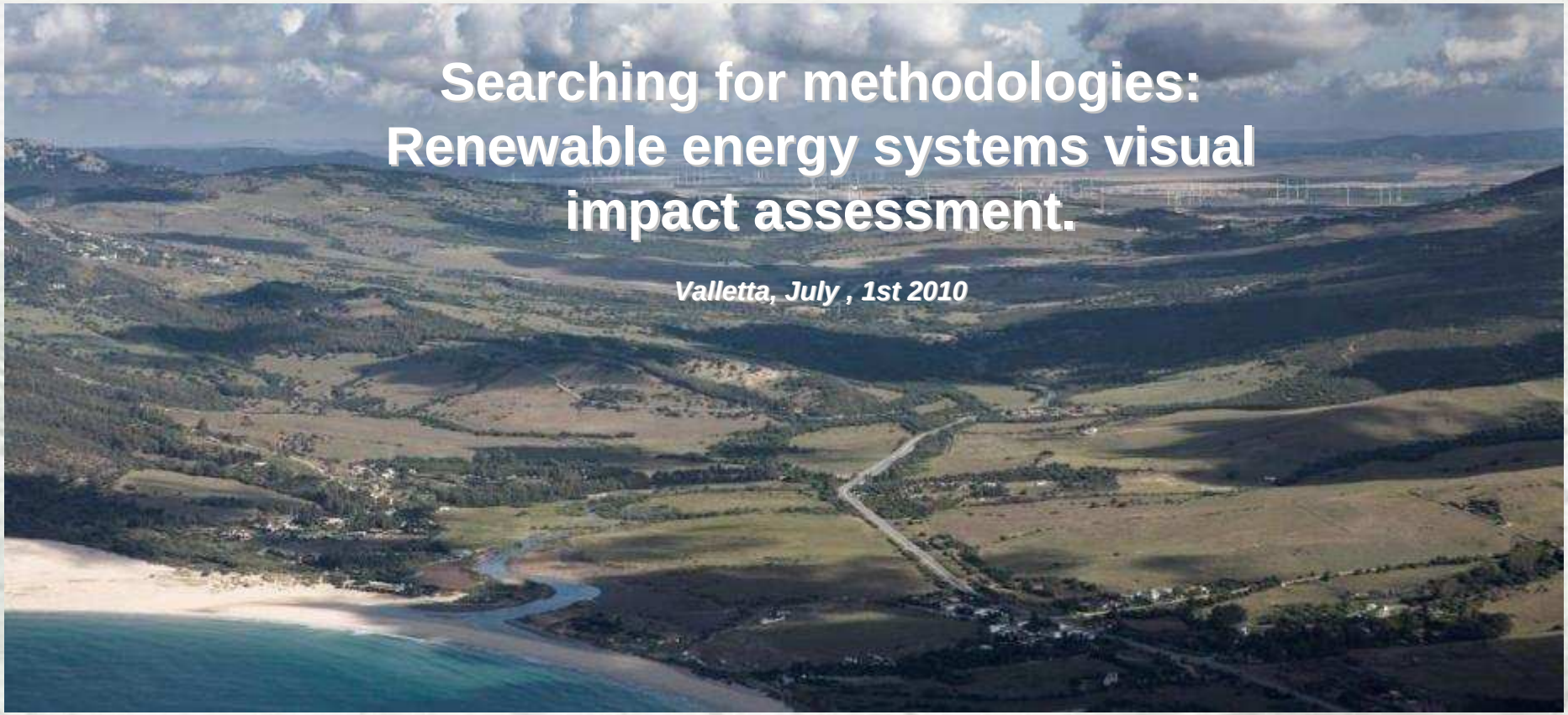

Searching for methodologies: Renewable energy systems visual impact assessment.

Valletta, July , 1st 2010

Main Aim:

To obtain a tool that allows visual impact assessment, and to apply it to renewable energy systems such as wind turbines, photovoltaic power plants, biomass plants… achieving the lowest possible visual impact.

Renewable energy systems visual impact assessment.

AIMS:

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Questions to answer:

Renewable energy systems visual impact assessment.

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2.- **What** kind of system?

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2.- **What** kind of system?
3.- **Which** system specifically?

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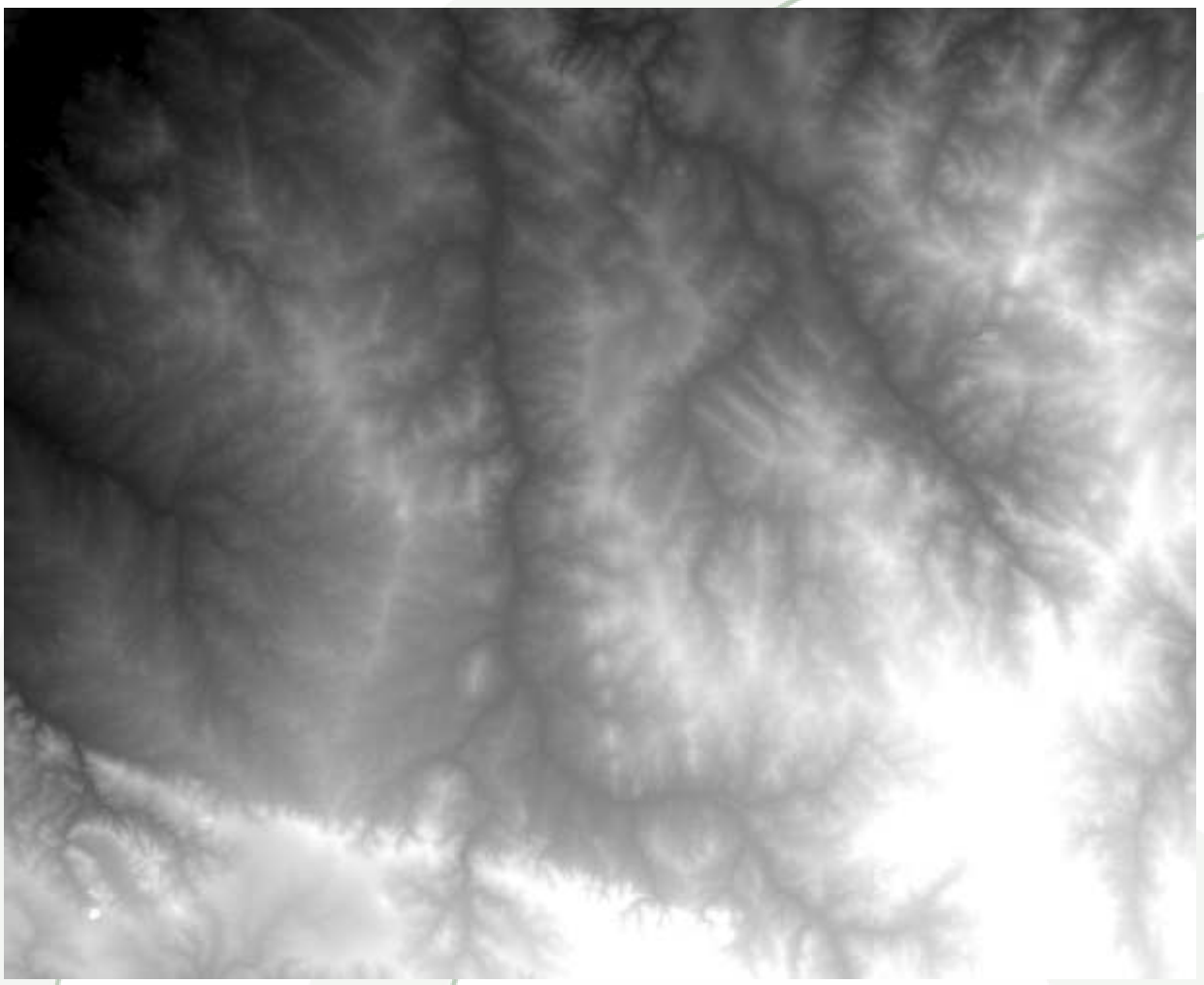
Questions to answer:

1.- **Where** do we place it?
2.- **What** kind of system?
3.- **Which** system specifically?
4.- **How** do we place it?

What do we know about an area?

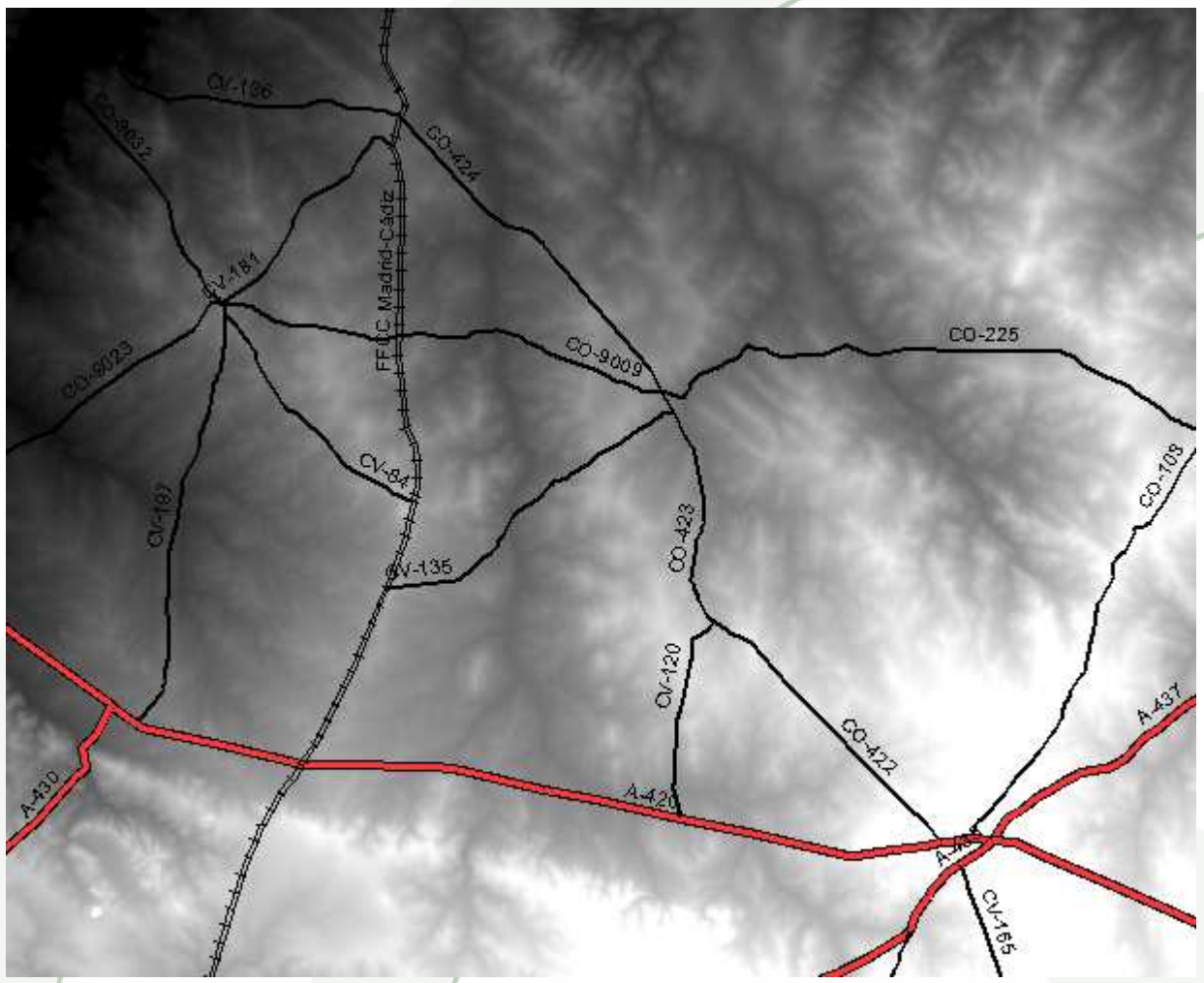
1.- The **height** (as a surface)



What do we know about an area?

1.- The **height** (as a surface)

2.- **Tracks, roads** and **railroads** features (as a layer)

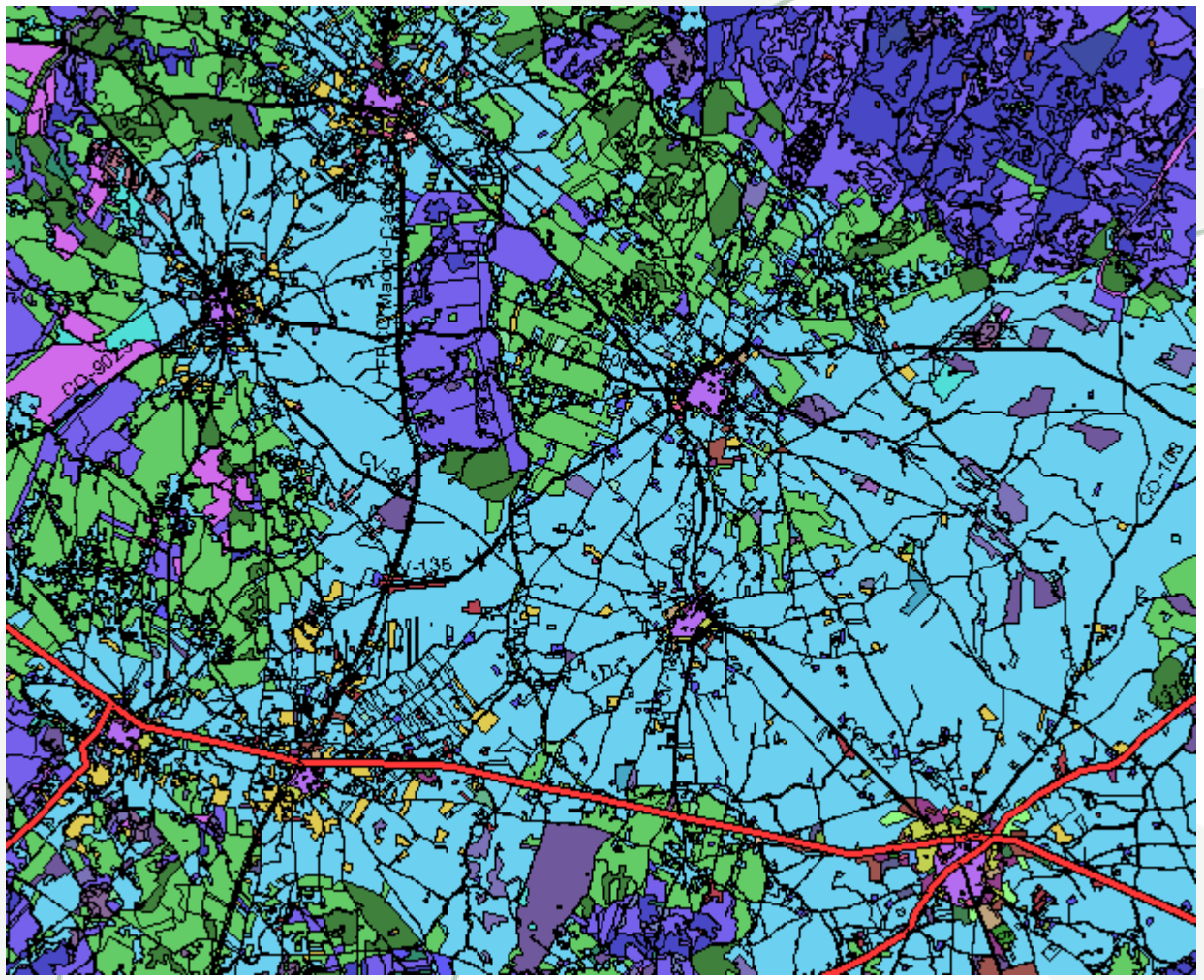


What do we know about an area?

1.- The height (as a surface)

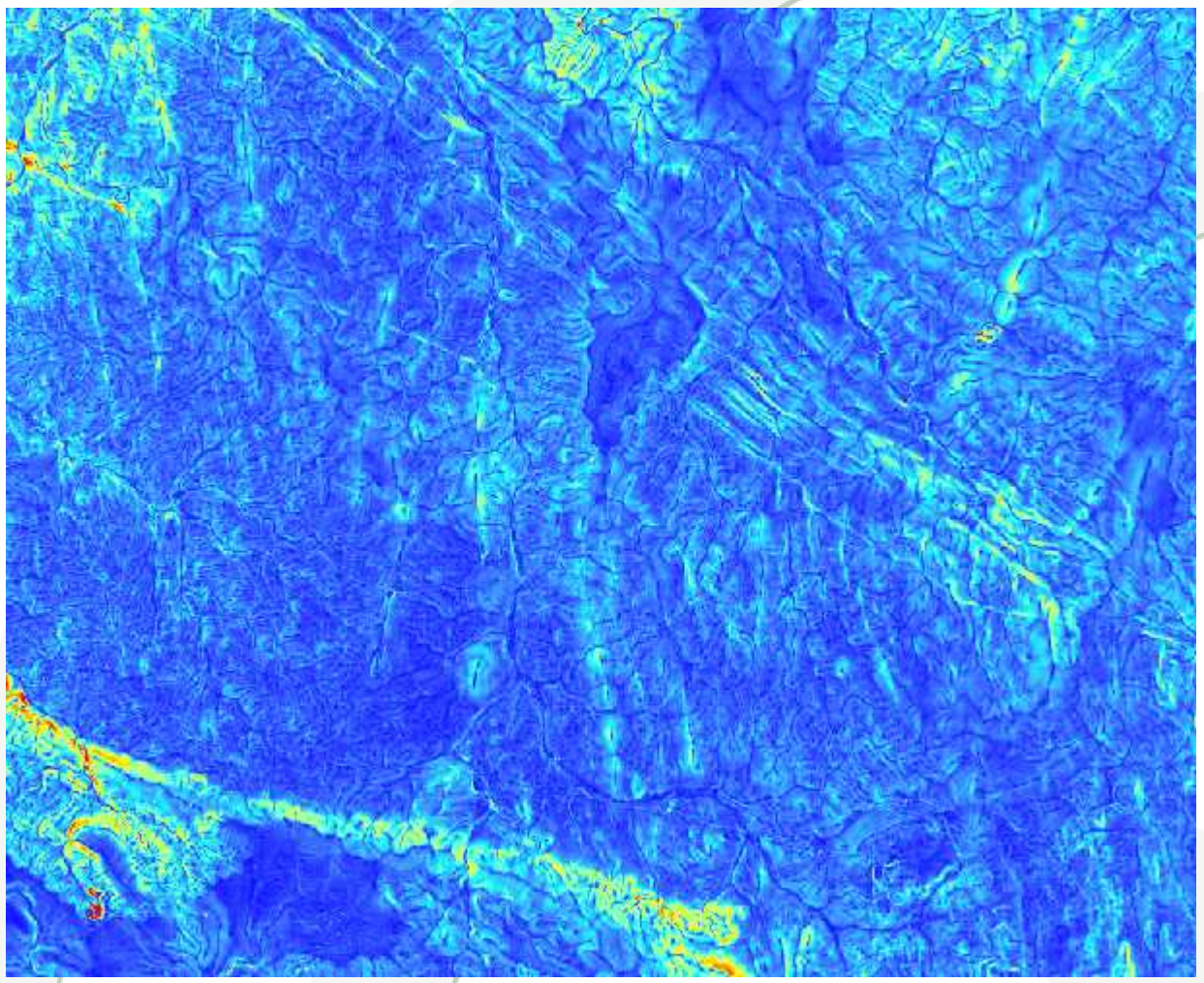
2.- Tracks, roads and railroads features (as a layer)

3.- Land uses & land coverages



What can we derive from the height?

1.1- The slope

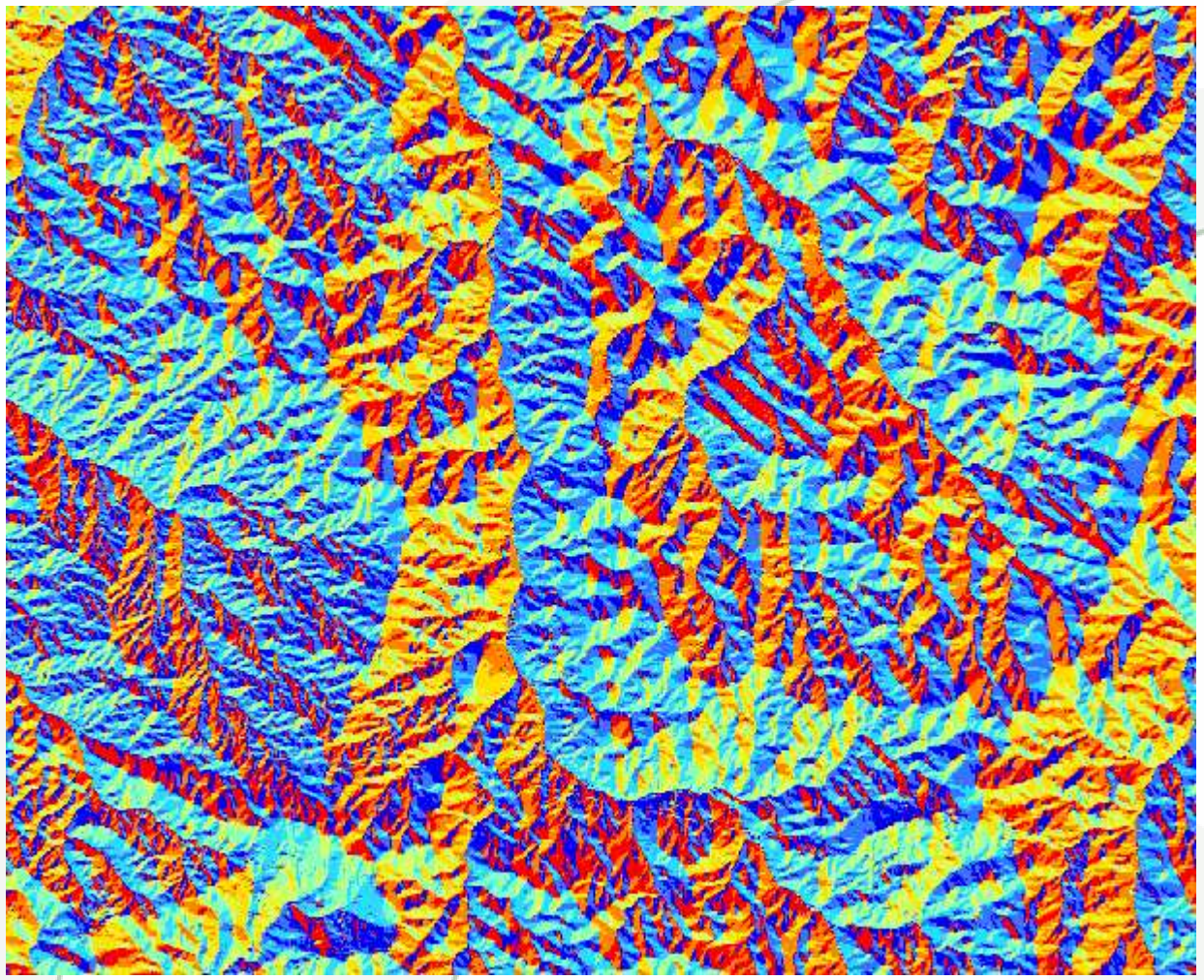


What can we derive from the height?

1.1- The slope

1.2- The aspect

And related to a point (source):



What can we derive from the height?

1.1- The slope

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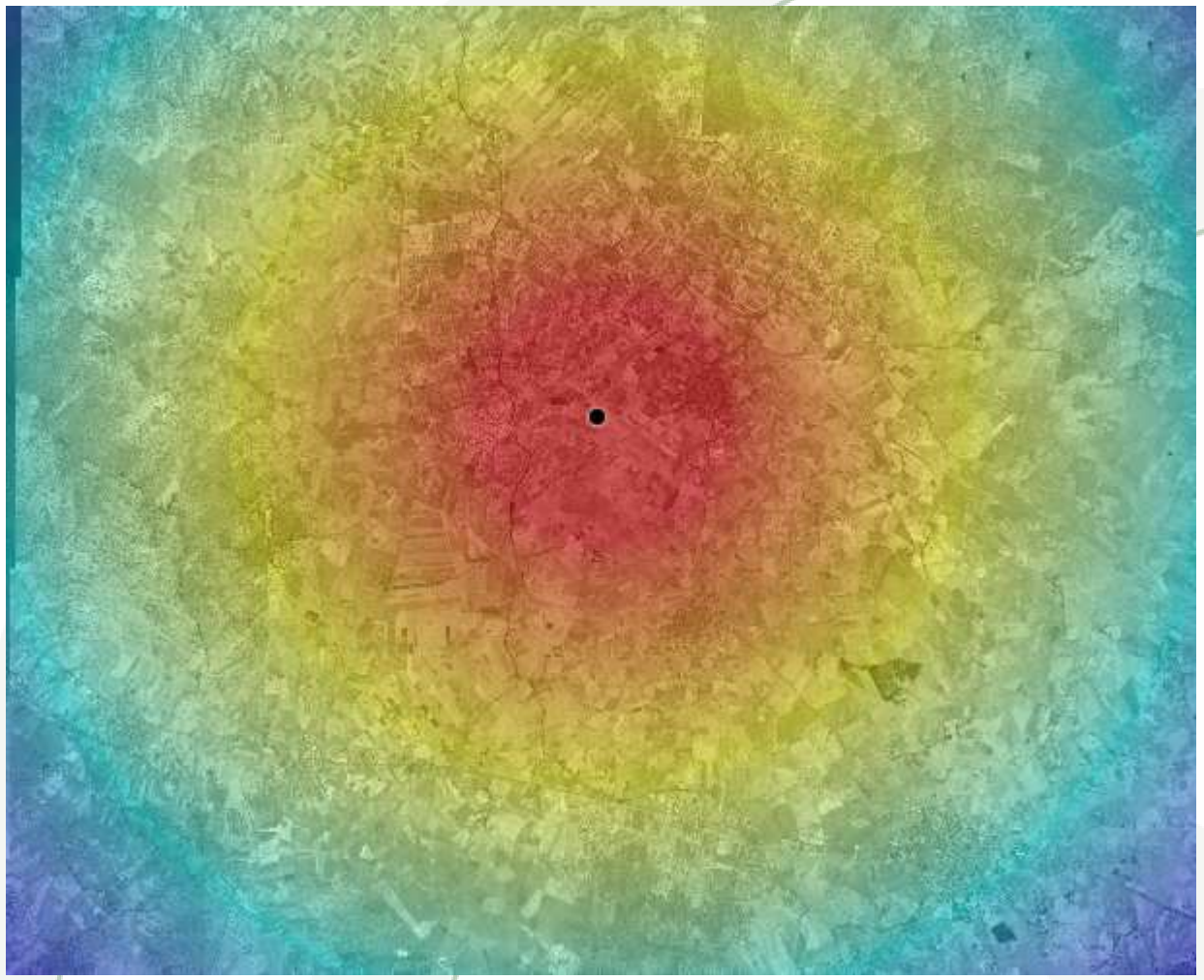
And related to a point (source):

1.3- The distance between any point and the source.



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And related to a point (source):

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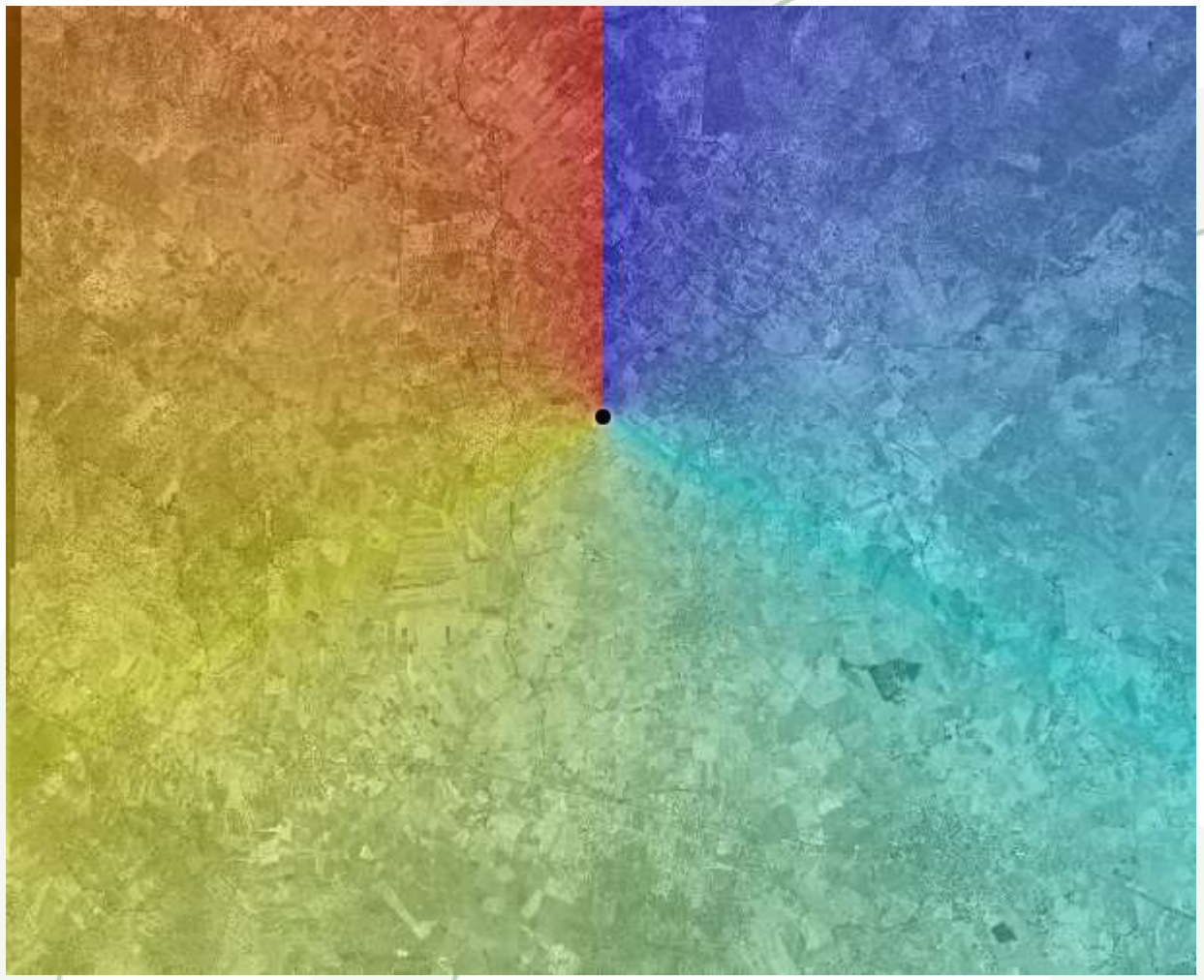

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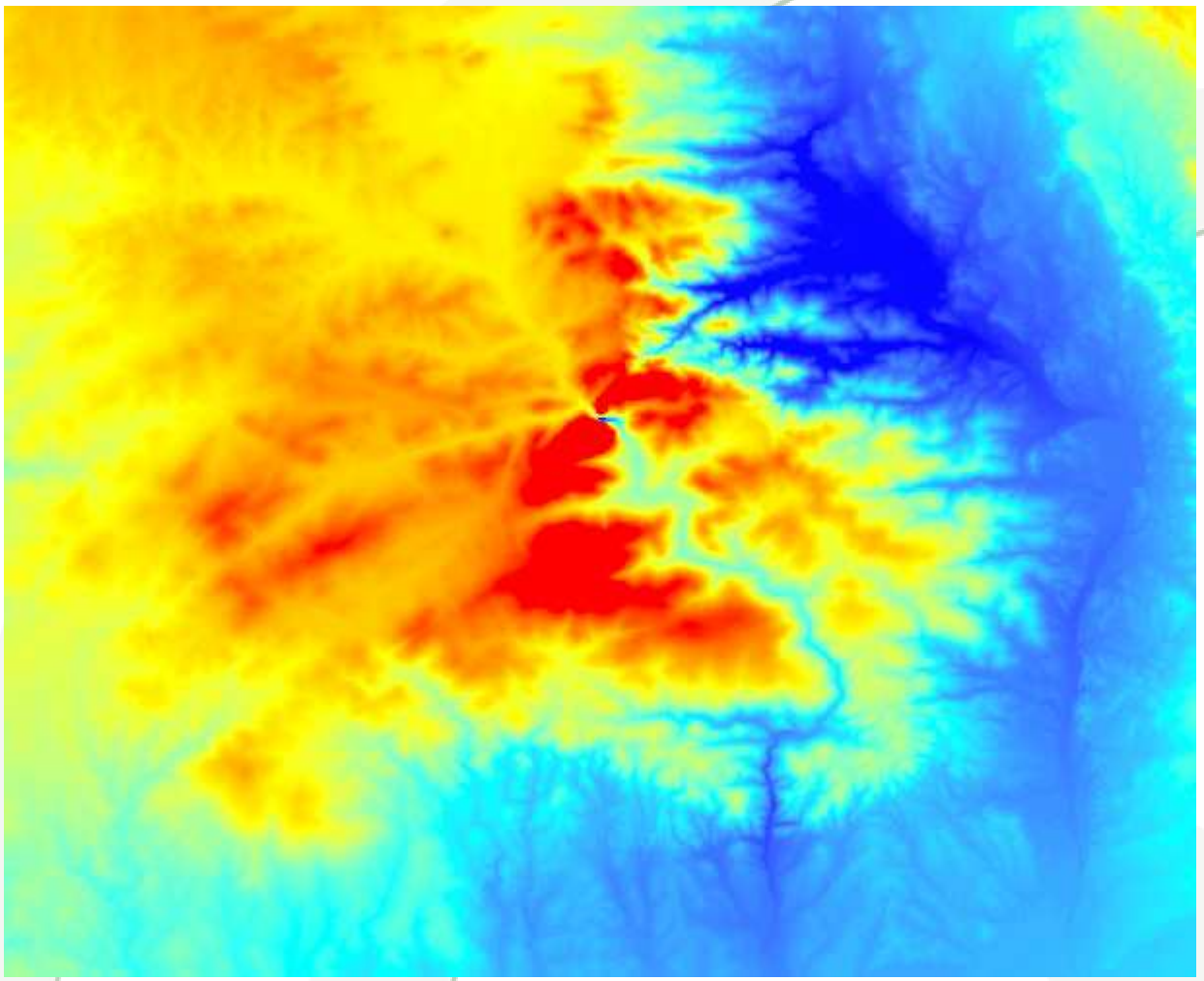


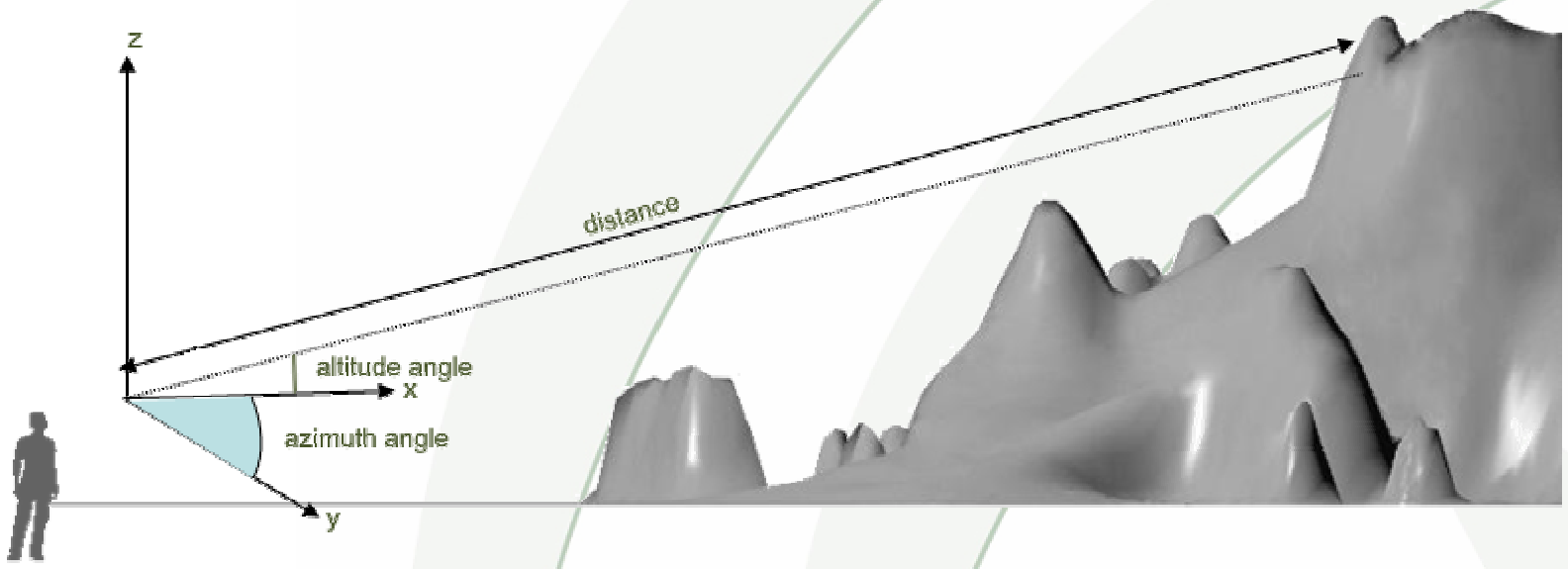
What can we derive from the height?

And related to a point (source):

1.3- The **distance** between any point and the source.

1.4- The **azimuth** between any point and the source.

1.5- The **altitude** between any point and the source.

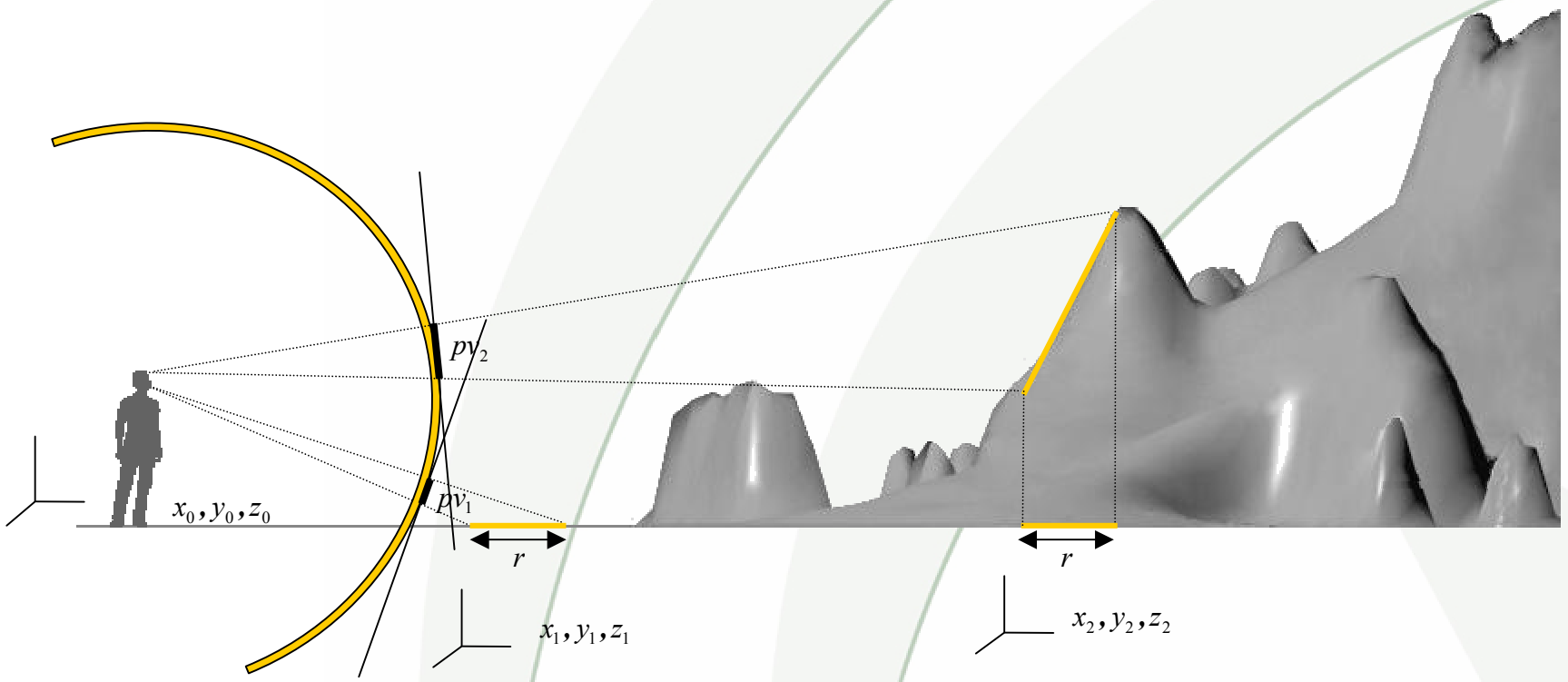


What else can we derive from the height?

Related to a point (source) too:

1.6- The visual projection

of any point into the source.

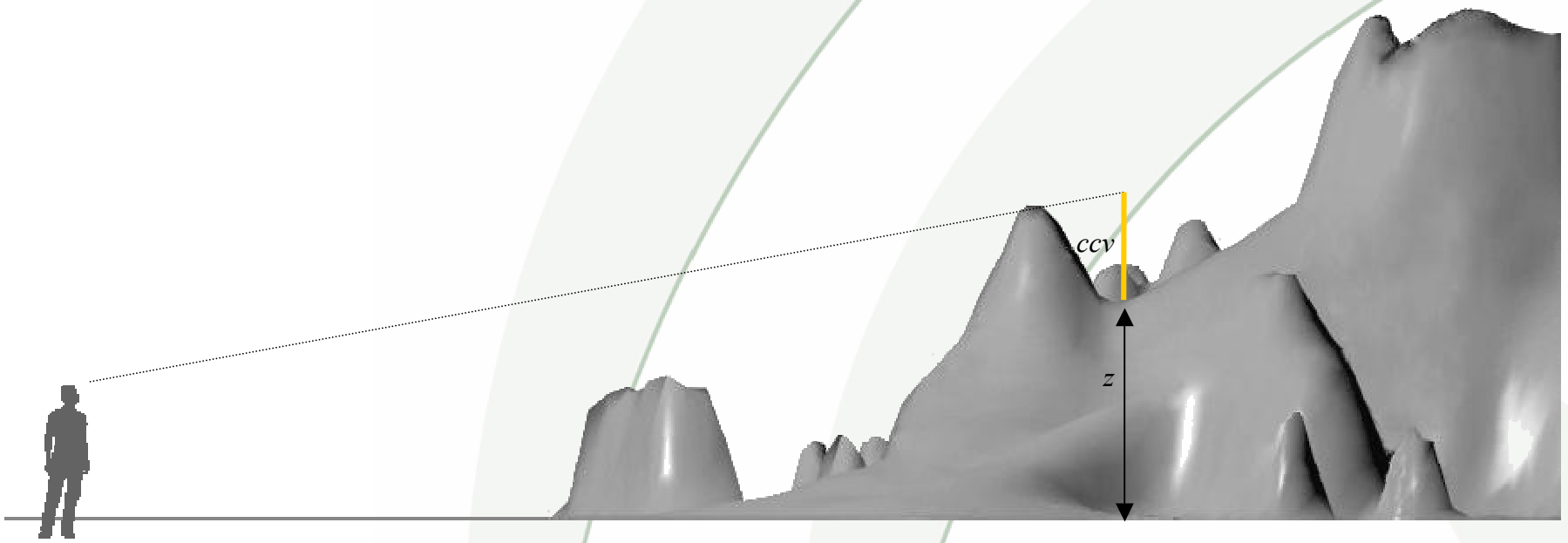


What else can we derive from the height?

Related to a point (source) too:

1.6- The visual projection of any point into the source.

1.7- The additional height we must add to any point to see it .



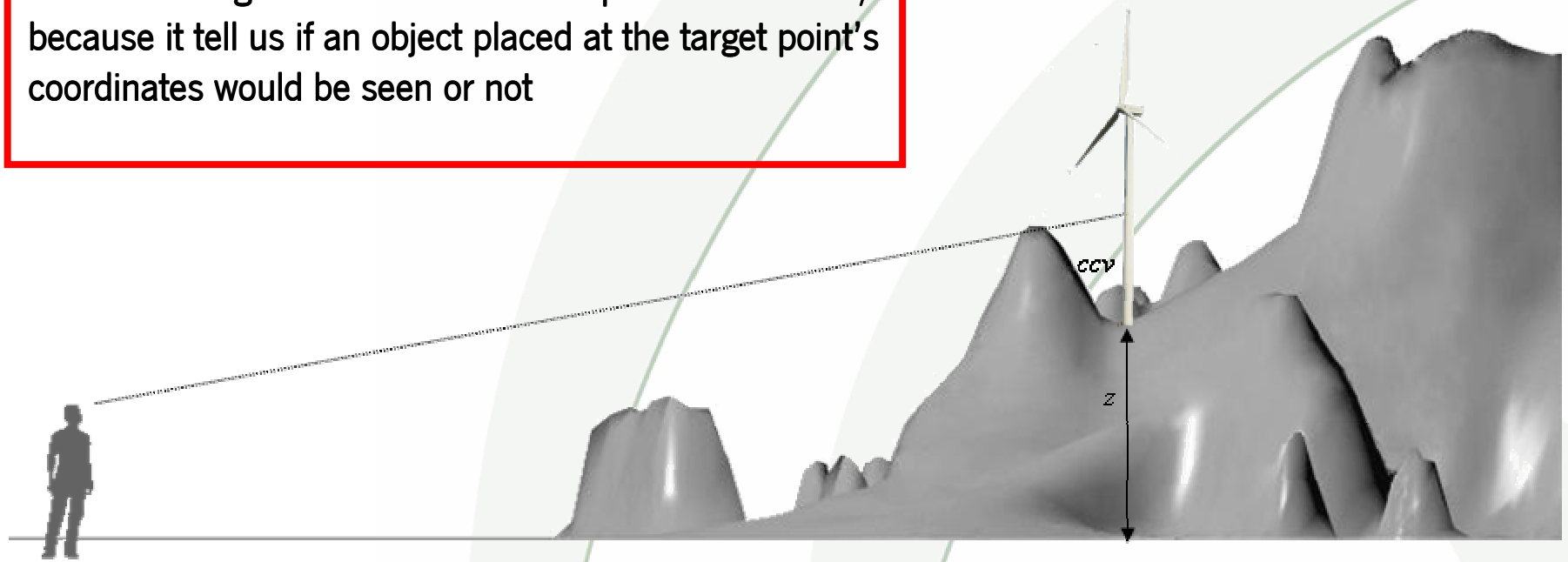
What else can we derive from the height?

Related to a point (source) too:

1.6- The visual projection of any point into the source.

1.7- The additional height we must add to any point to see it

Additional height is useful in visual impact assessment, because it tell us if an object placed at the target point's coordinates would be seen or not



What else can we derive from the height?

Related to a point (source) too:

1.6- The visual projection of any point into the source.

1.7- The additional height we must add to any point to see it

If this value is <=0, the source can see the target point naturally, so we can obtain viewsheds from it.

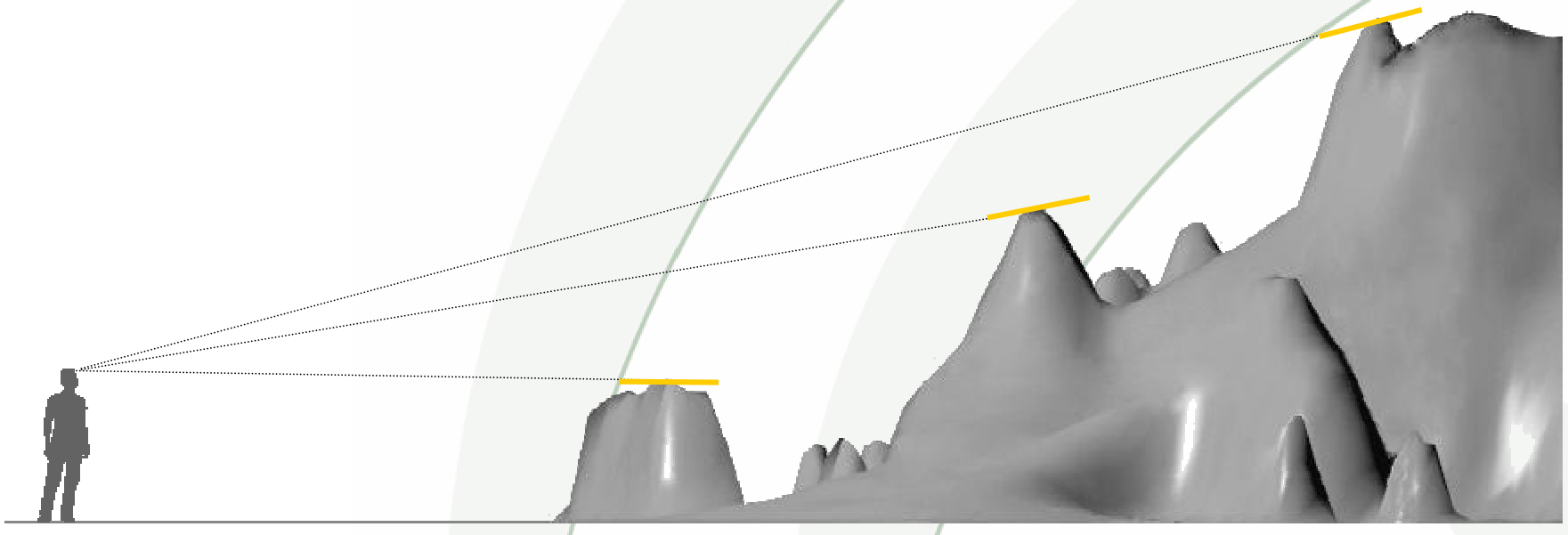
What else can we derive from the height?

Related to a point (source) too:

1.6- The visual projection of any point into the source.

1.7- The additional height we must add to any point to see it

1.8- The horizon points that limit the viewshed.



What else can we derive from the height?

1.1- The slope

1.2- The aspect

1.3- The distance between any point and the source.

1.4- The azimuth between any point and the source.

1.5- The altitude between any point and the source.

1.6- The visual projection of any point into the source.

1.7- The additional height we must add to any point to see it

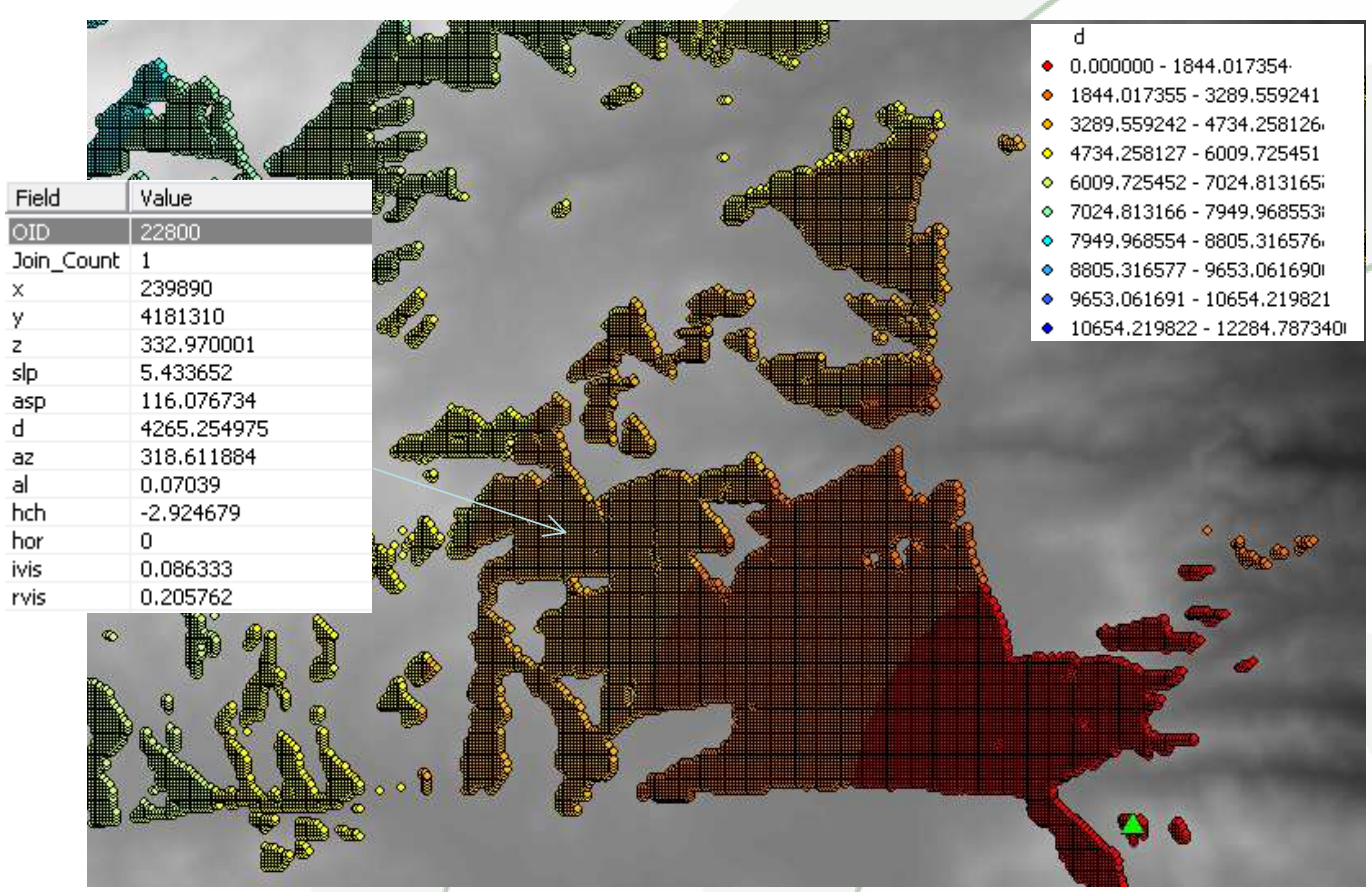
1.8- The horizon points that limit the viewshed.

We can store all this info into tables:

	FID	x	y	z	slp	asp	d	az	al	hch	hor	ivis	rvis
	0	232710	4183790	460.350006	14.971813	177.602385	13574.69705	312.551931	0.867557	-4.836949	1	0.172161	-9999
	1	232710	4183810	465.450012	13.490663	177.222635	13588.230201	312.614055	0.888192	-5.156064	1	0.155331	-9999
	2	232710	4183830	470.049988	11.630769	178.399228	13601.779295	312.676055	0.90668	-4.717698	1	0.129907	-9999
	3	232710	4183850	473.670013	9.709006	181.109284	13615.344285	312.737932	0.921007	-3.750259	1	0.101491	-9999
	4	232710	4183870	476.820007	8.171239	183.943364	13628.925123	312.799686	0.933328	-2.903867	1	0.079042	-9999
	5	232710	4183890	479.470001	6.591408	183.690309	13642.521761	312.861316	0.943524	-2.228646	1	0.062162	-9999
	6	232710	4183910	481.470001	4.721741	177.224148	13656.134153	312.922824	0.950973	-1.754901	1	0.047066	-9999
	7	232710	4183930	482.720001	2.644058	155.620262	13669.762251	312.984209	0.955263	-1.22233	1	0.027201	-9999

Viewing the source point's associated info:

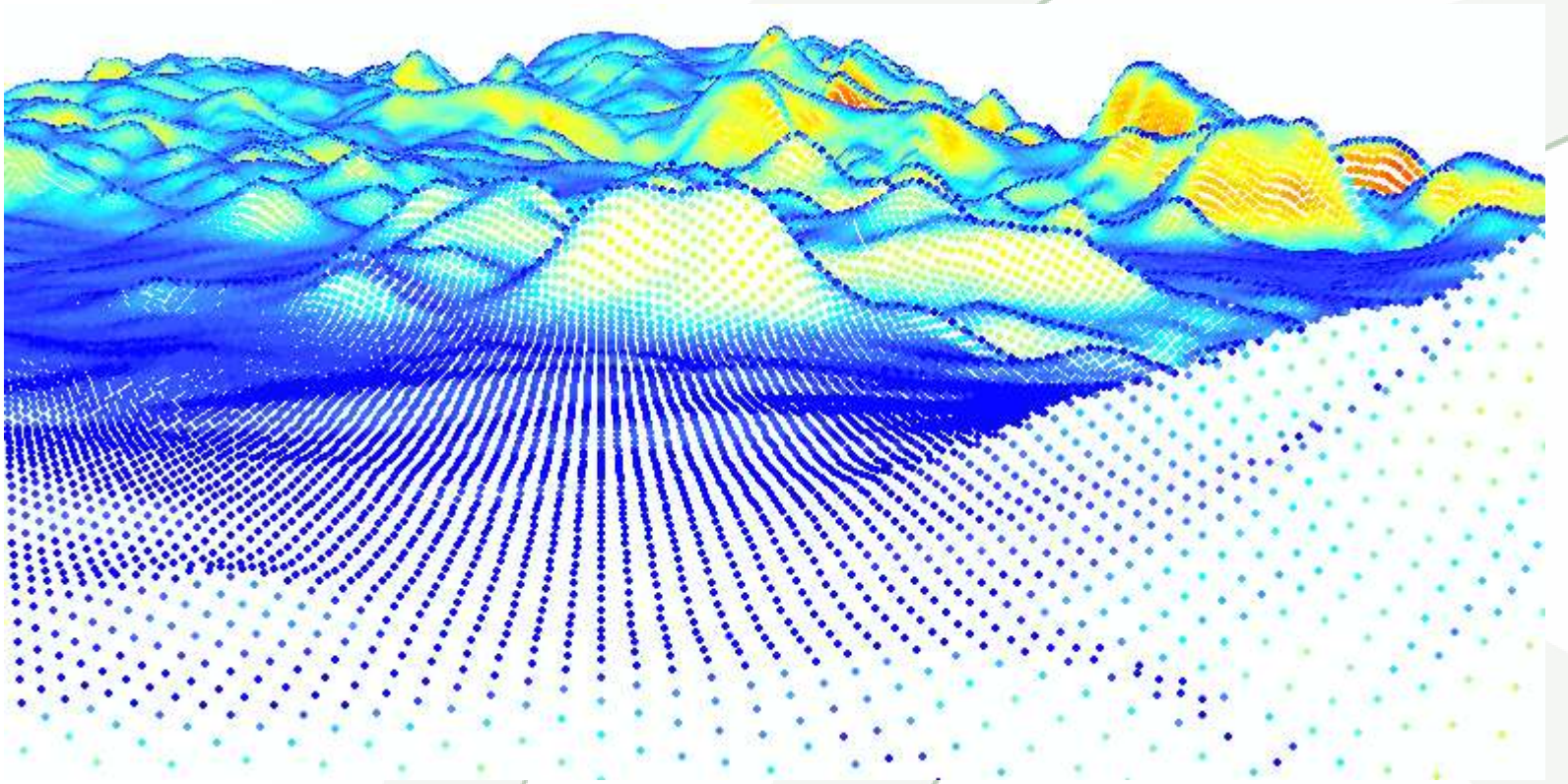
EG1 - The cartesian view of viewshed, the colour relates to the distance from source :



Field	Value
OID	22800
Join_Count	1
x	239890
y	4181310
z	332.970001
slp	5.433652
asp	116.076734
d	4265.254975
az	318.611884
al	0.07039
hch	-2.924679
hor	0
ivis	0.086333
rvis	0.205762

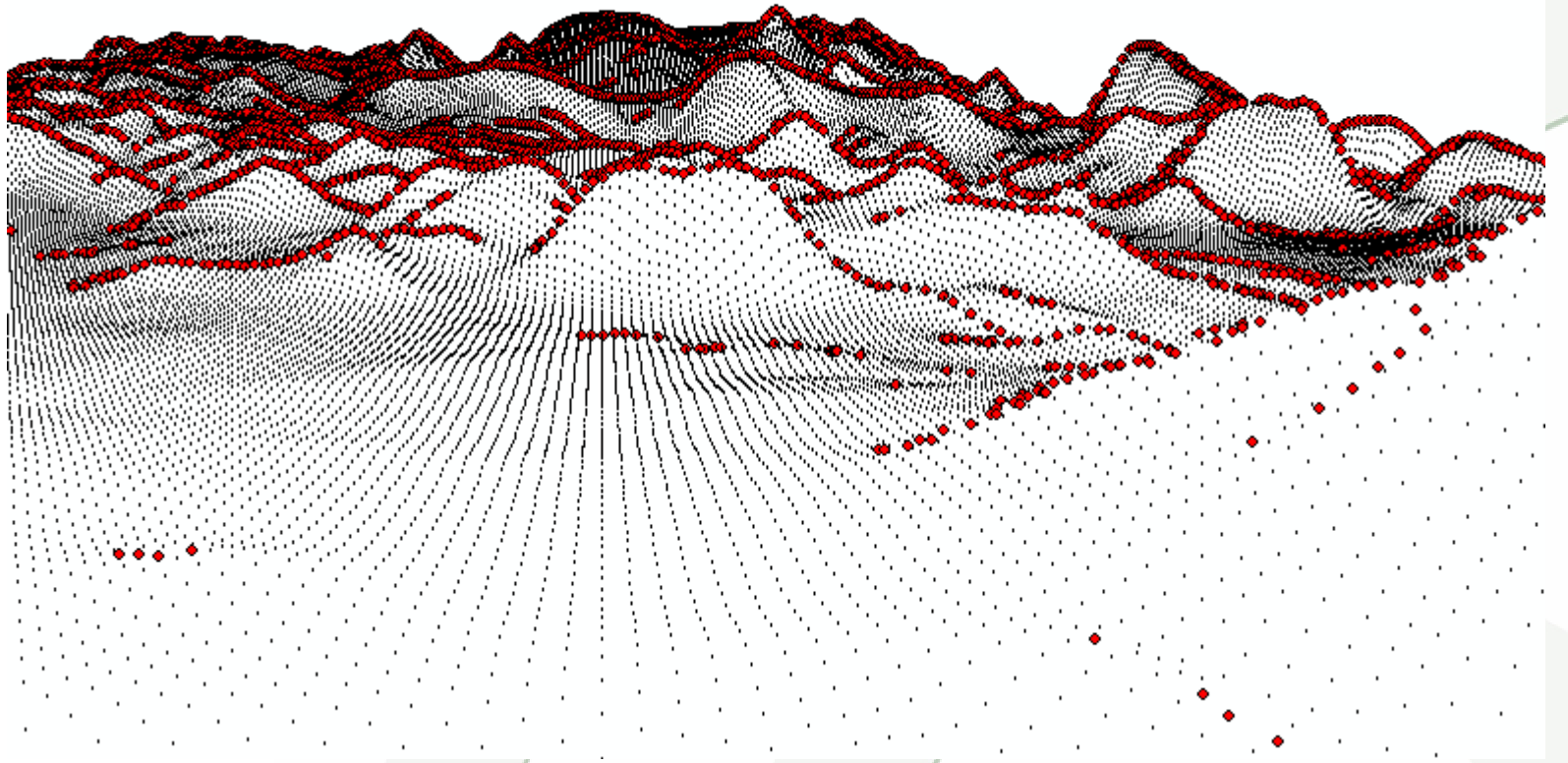
Viewing the source point's associated info:

EG2 - The polar view of viewshed, the colour relates to the visual projection:



Viewing the source point's associated info:

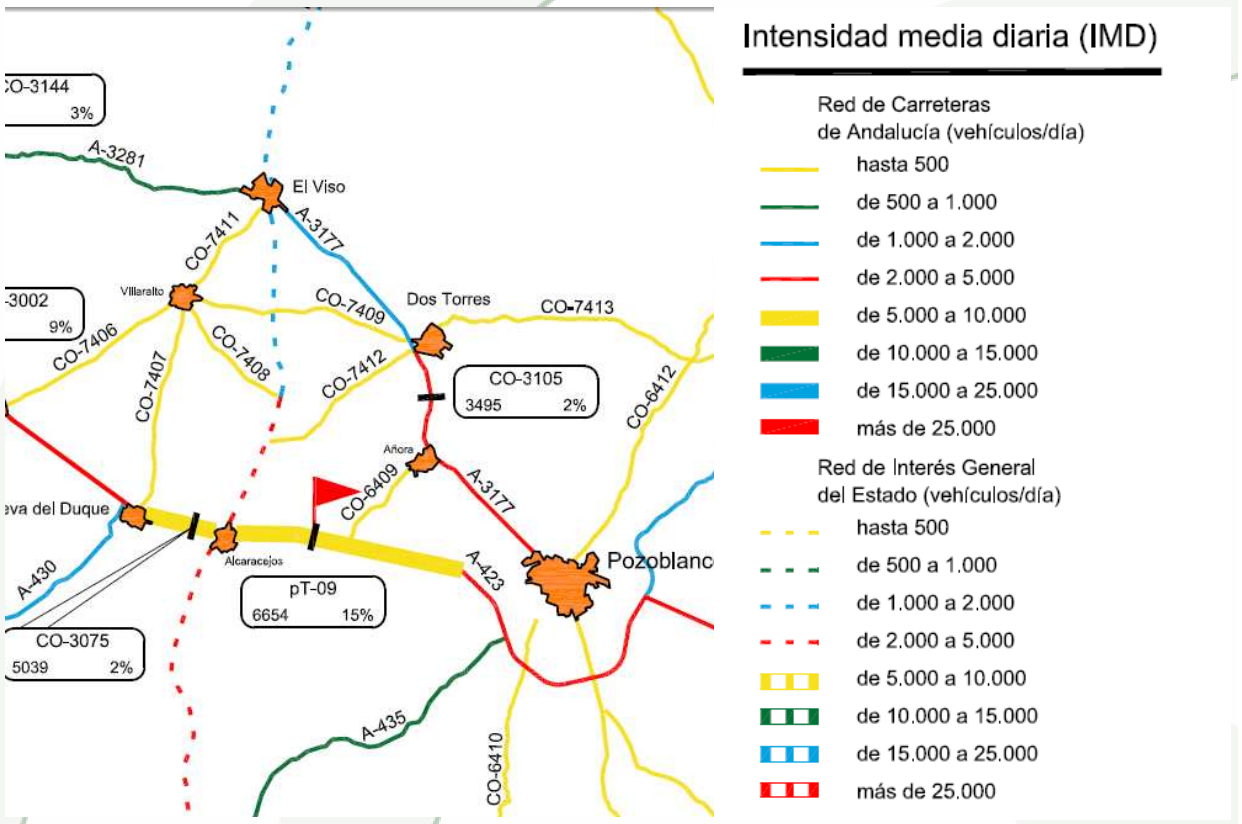
EG3 - The polar view of viewshed, red points are horizon points:



What can we know about tracks, roads and railroads?

We can evaluate them attending to:

1.- Number of people that uses each one

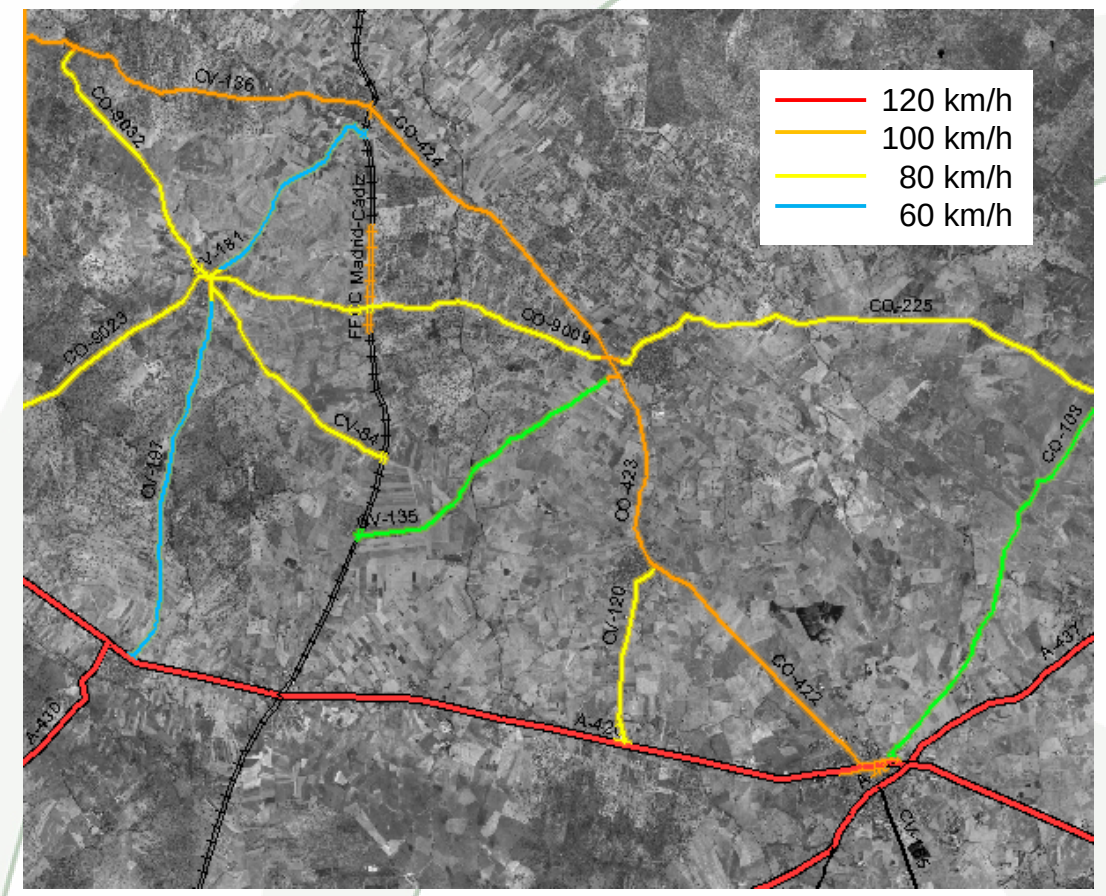


What can we know about tracks, roads and railroads?

We can evaluate them attending to:

1.- Number of people that uses each one

2.- Max speed allowed



What can we know about tracks, roads and railroads?

We can evaluate them attending to:

1.- Number of people that uses each one

2.- Max speed allowed

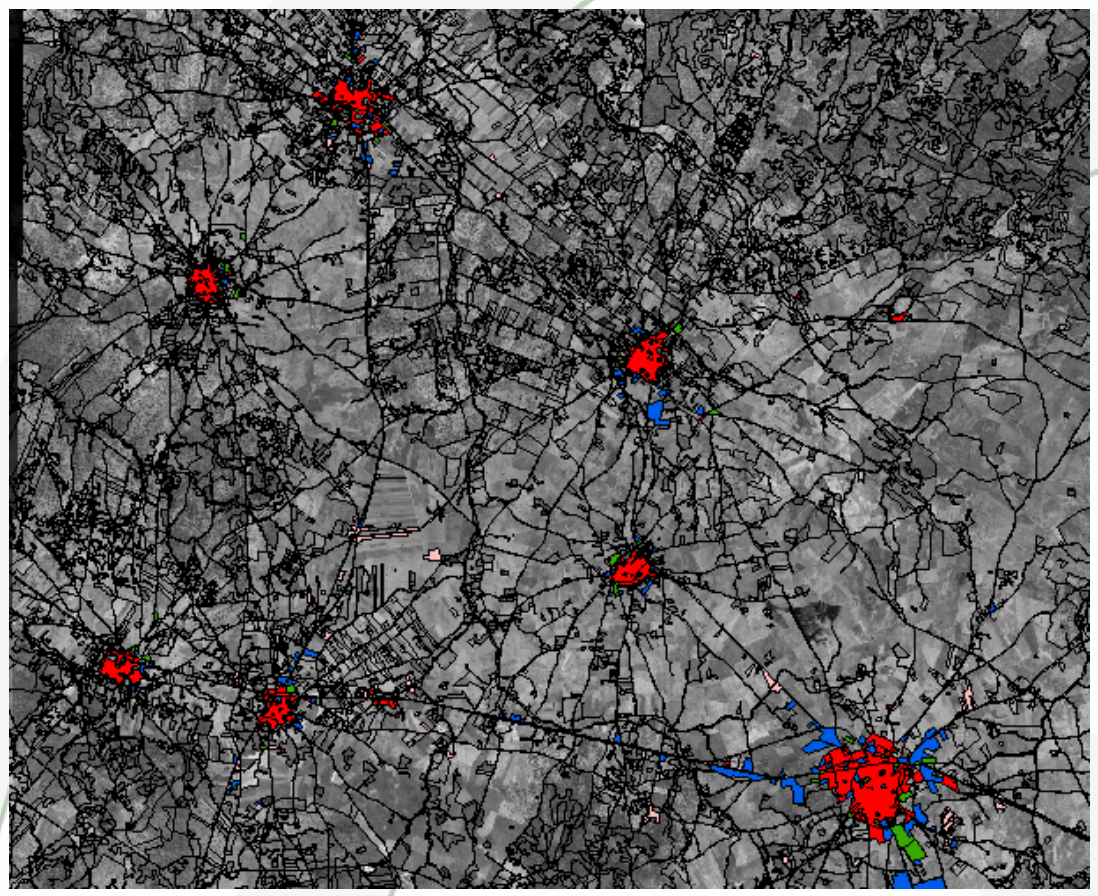
3.- Twisted/straight sections

All this in order to obtain information about how probable is to find people observing from every point

What can we know about land use and coverage?

We can extract from them:

1.- Where people live , work and spend free time.



What can we know about land use and coverage?

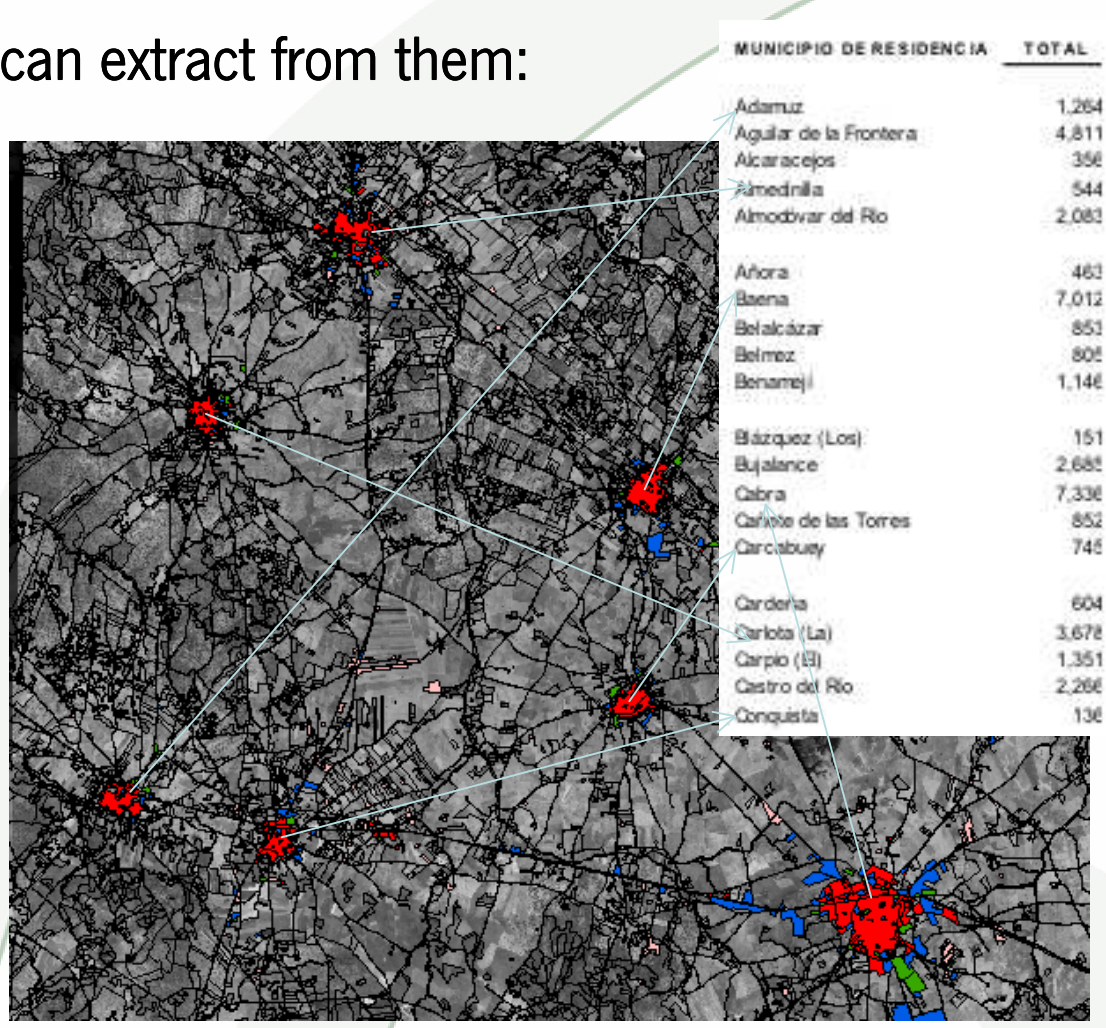
We can extract from them:

1.- Where people live , work and spend free time.

...and after...

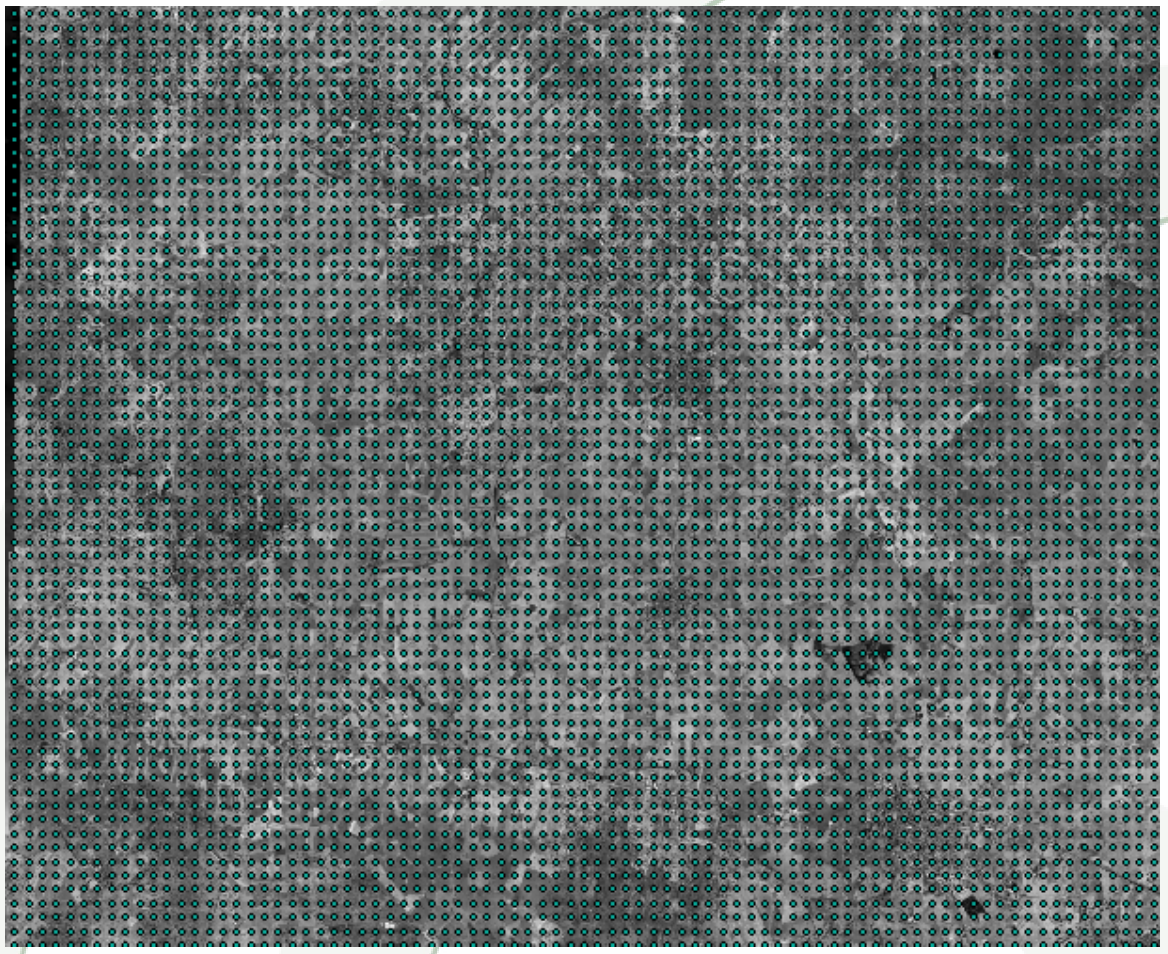
2.- How many people do (population, capacities...)

All this in order to obtain information about how probable is to find people observing from every point



What could we do now?

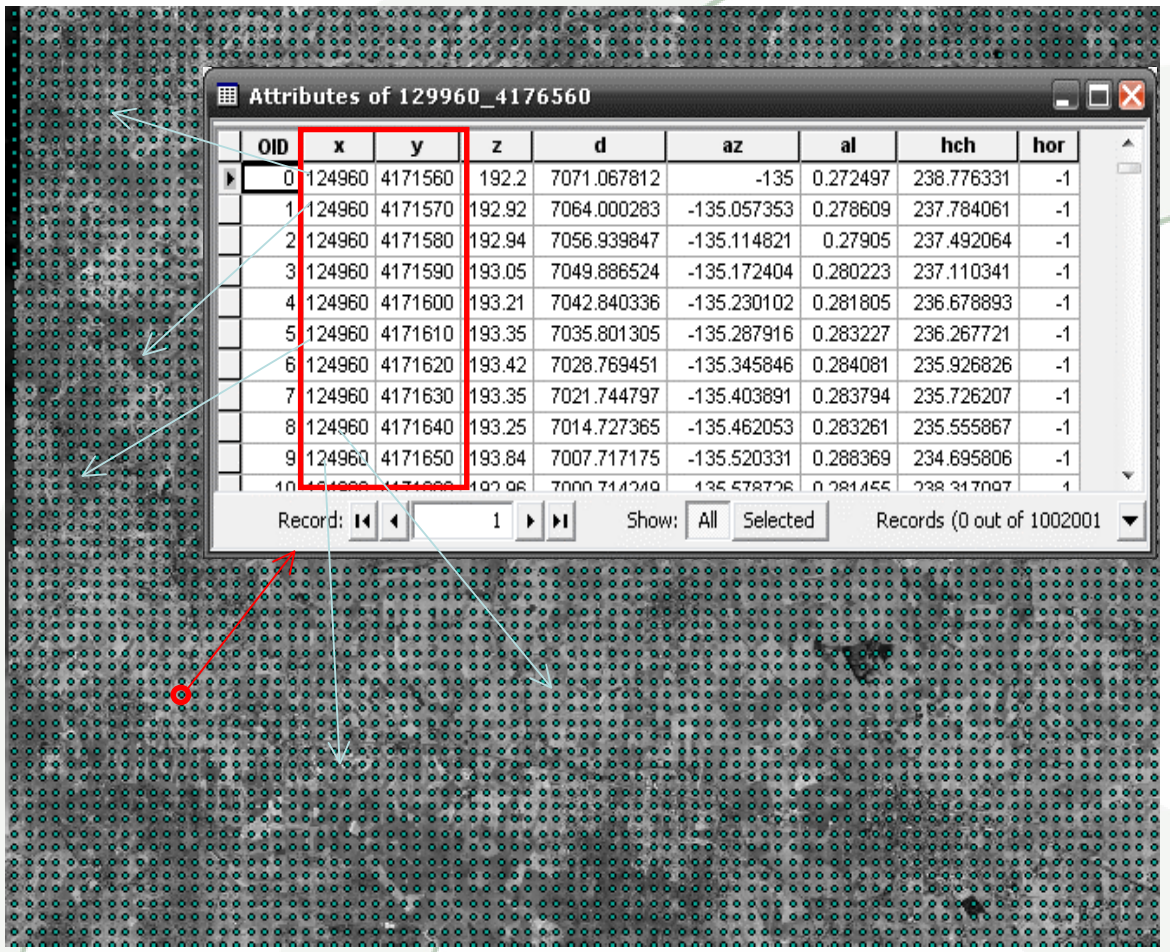
1.- We can extend a dense grid of points over the territory



What could we do now?

1.- We can extend a dense grid of points over the territory

2.- And obtain the relative values of each one to every other, including its viewshed and the additional heights



What could we do now?

1.- We can extend a dense grid of points over the territory

2.- And obtain the relative values of each one to every other, including its viewshed and the additional heights

3.- We can also assess the source point's local accesibility

...SO...

What could we do now?

4.- Adding to every visible (or becoming visible if we add a given height) point the source point's local accesibility, weighted by the distance, the visual projection (and evenly by the azimuth, on roads and railroads), and iterating the process through every source point we could obtain the given area's remote accesibility map for objects with that height that could be placed over that area.

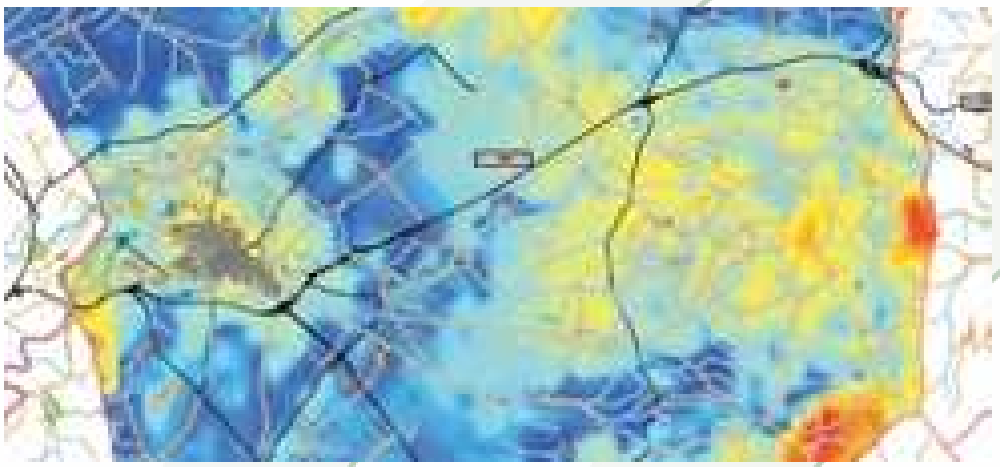
What could we do now?

4.- Adding to every visible (or becoming visible if we add a given height) point the source point's local accesibility, weighted by the distance, the visual projection (and evenly by the azimuth, on roads and railroads), and iterating the process through every source point we could obtain the given area's remote accesibility map for objects with that height that could be placed over that area.

The remote accesibility map means how much an hypotetical object affects depending on its situation – isn't it the visual impact?

What do we expect?

The remote accesibility map for a given area and for objects of a given height should look like:



Where red and orange mean places where we can expect a high visual impact and cyan and blue mean places where it will be low.

1.- Where do we place it? ✅

What do we expect?

We can repeat the procedure for the same area, with another height for the objects, and compare the results, choosing between extensive o intensive systems.

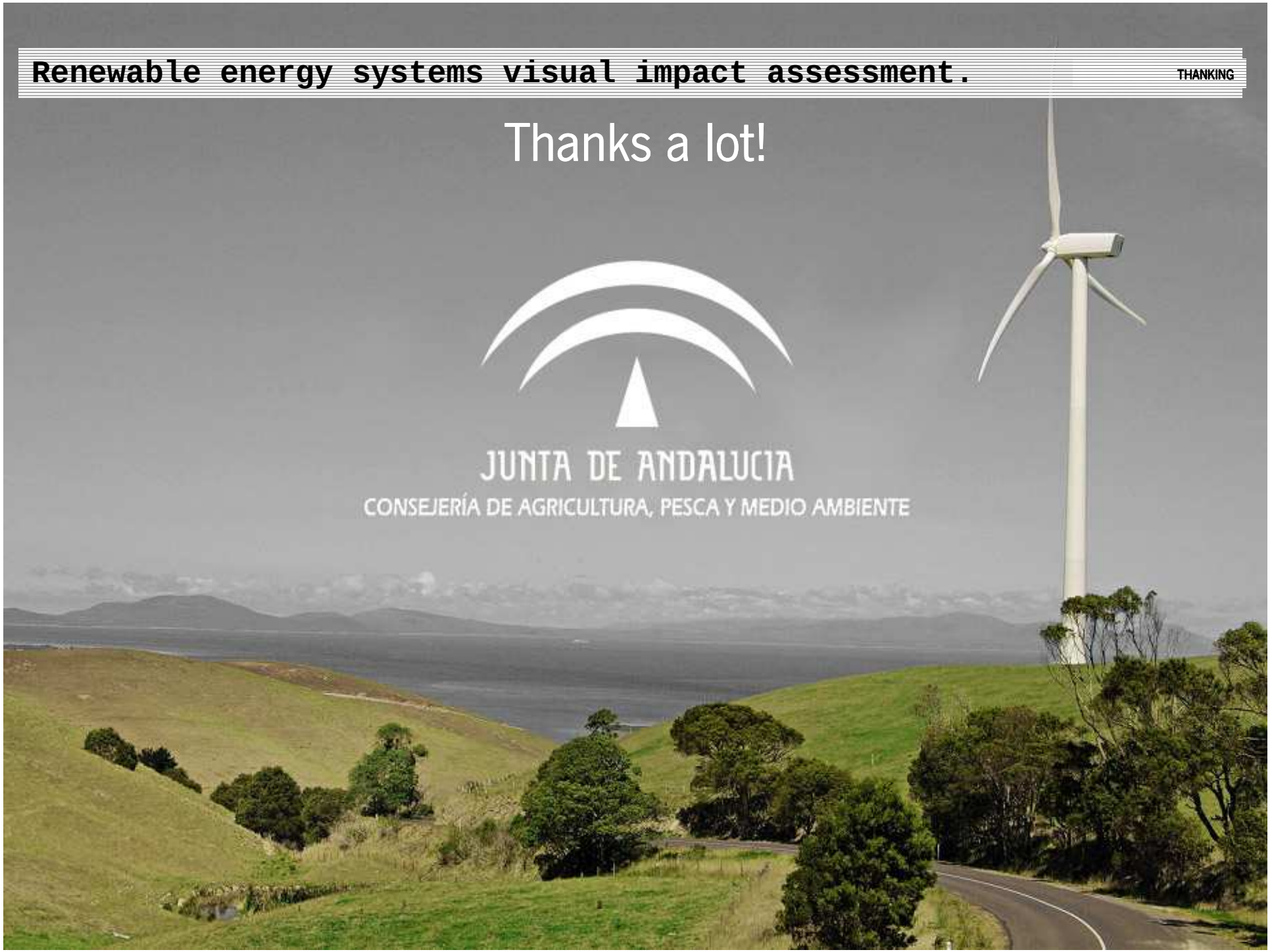
2.- **What** kind of system? 

3.- **Which** system specifically? 

Zooming to the desired location and assessing its remote accesibility values, we can place objects accurately, or suggest some rules for placing them.

4.- **How** do we place it? 

Thanks a lot!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