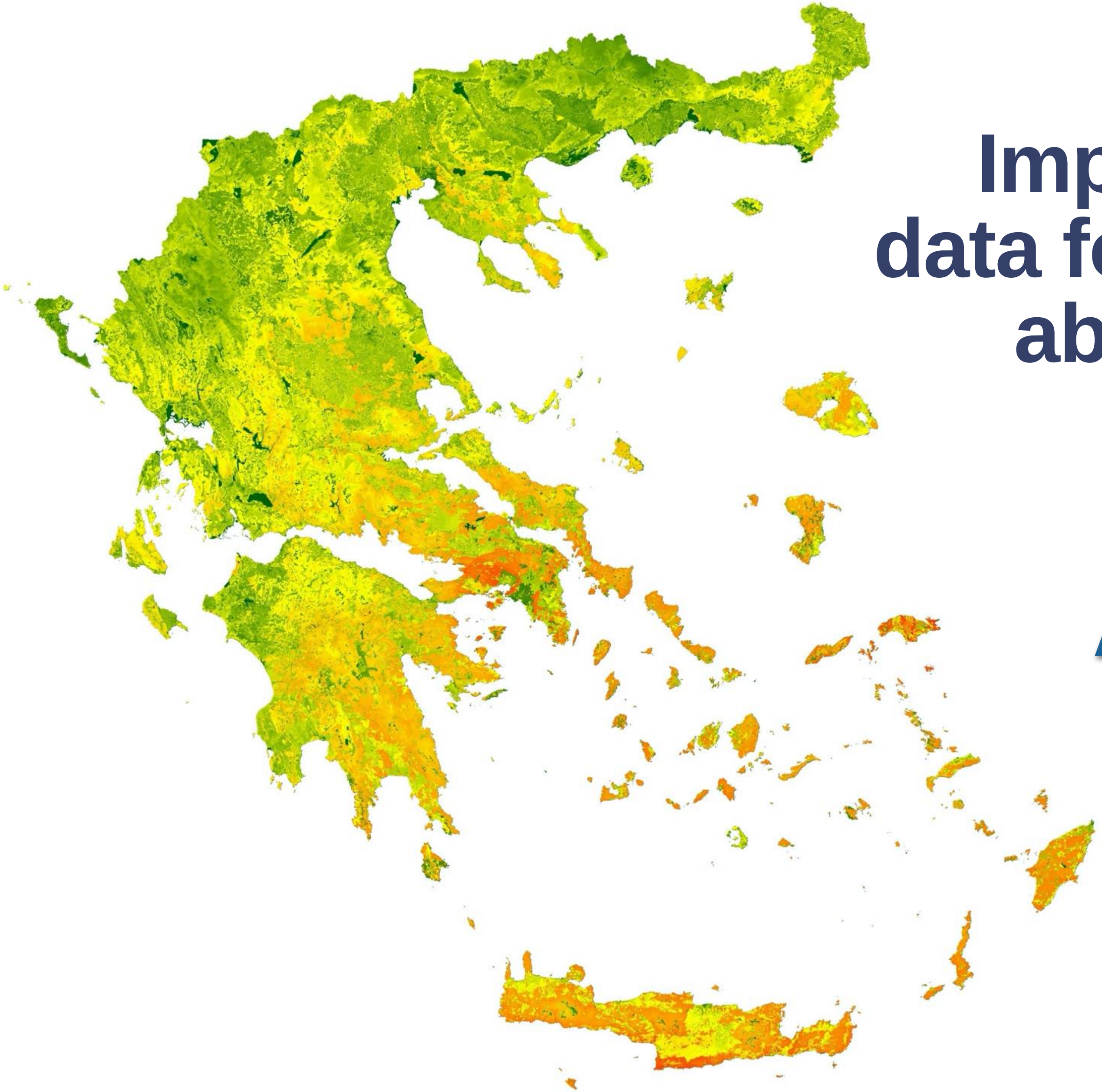

Improvements in the available data for the assessment of water abstraction and water quality

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Background / Context
Water Quality - Greece

Impact indicators covered

- I.11 “Water quality”. The indicator is complex and consist of the following two sub-indicators:

1) Gross Nutrient Balance:

- 1.a) Gross Nitrogen Balance (GNB-N): Gross Nitrogen Surplus
- 1.b) Gross Phosphorus Balance (GNB-P): Gross Phosphorus Surplus

2) **Nitrates in freshwater:**

- 2.a) Quality of surface water: % of monitoring positions belonging to three quality classes (high, moderate, bad)
- 2.b) Quality of ground water: % of monitoring positions belonging to three quality classes (high, moderate, bad)

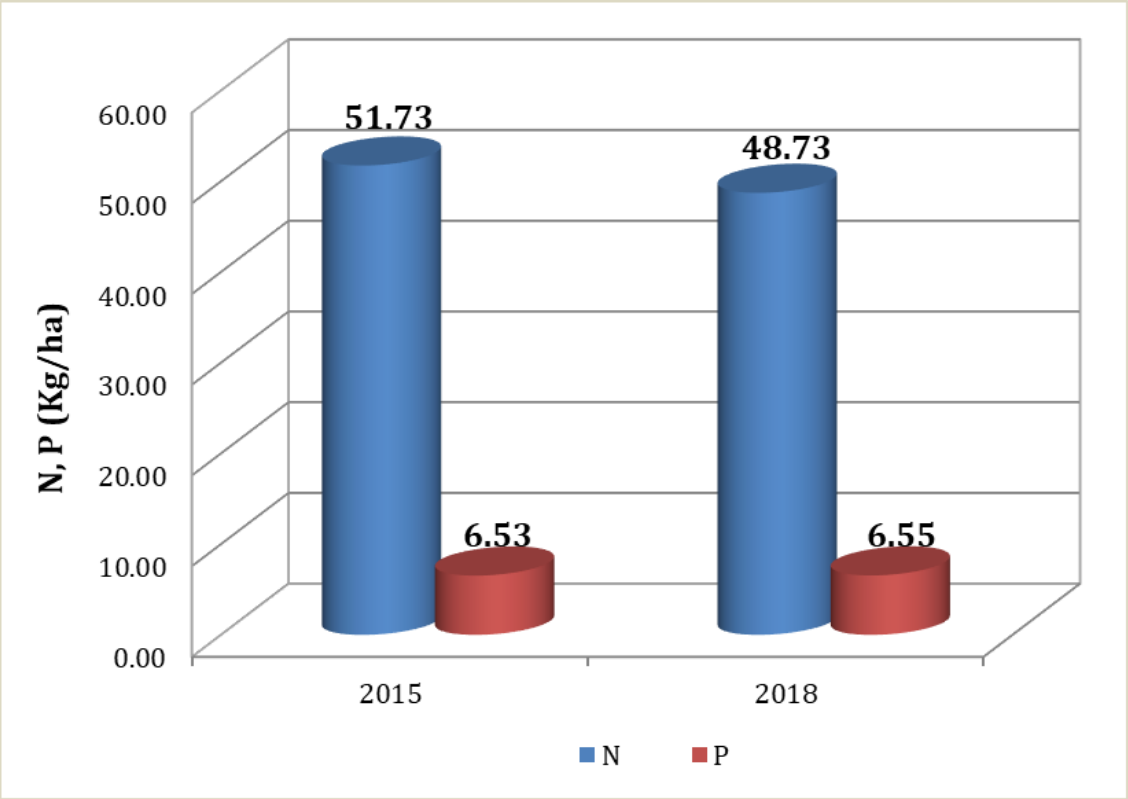
Both aforementioned sub-indicators relate to nutrient inputs management in farms and mainly to fertilizers management

I.11 Gross Nutrient Balance Methodological approach applied in Greece

- The estimation was based on the relevant Eurostat calculation guide: Eurostat (2013) - Nutrient Budgets – Methodology and Handbook (Version 1.02. Eurostat and OECD, Luxembourg)

Inputs: inorganic fertilizers, manure production and biological N fixation

Outputs: crop and fodder production



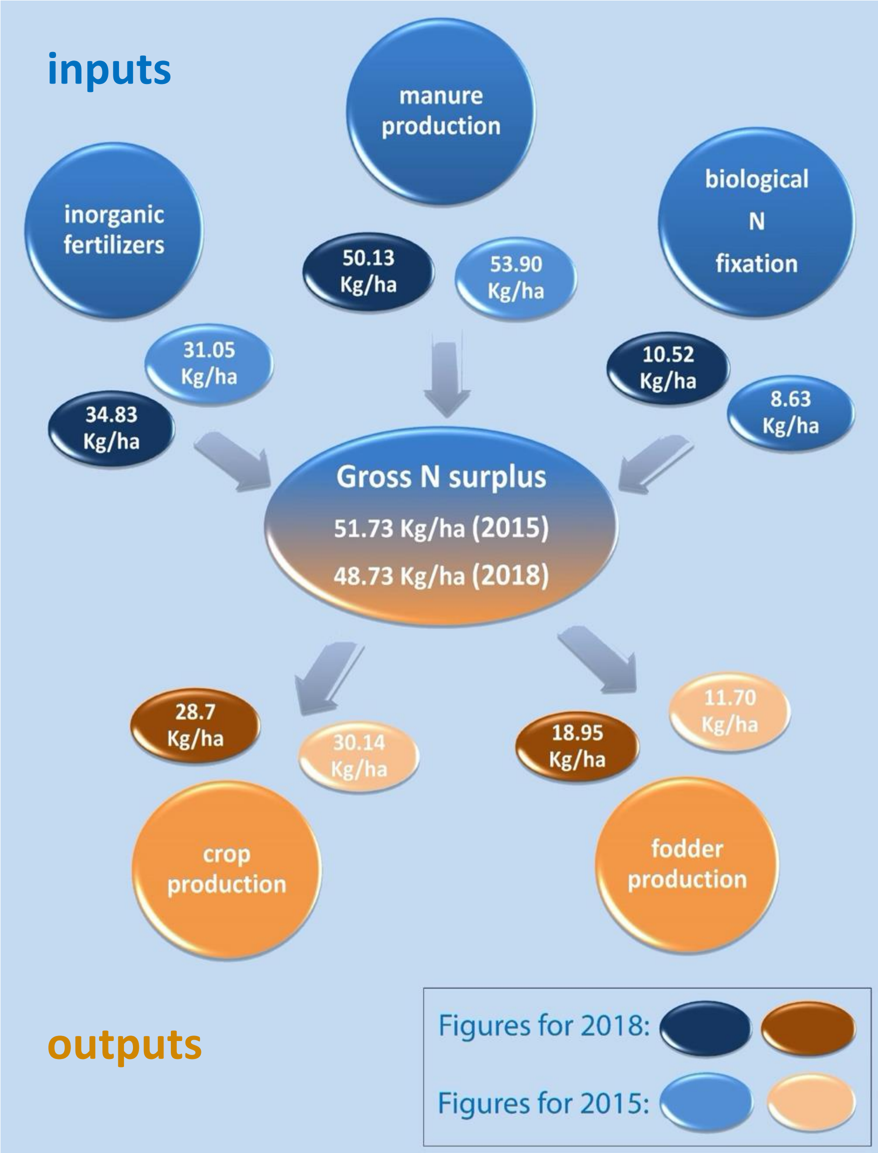
Gross Nutrient Balance 2015 - 2018

Key issues:

1. High uncertainty
2. Generally, inorganic fertilisers (the most certain figure) is not the dominant factor
3. The methodology for the estimation of the gross nutrient balance is very complicated
4. Documentation on the involved coefficients, equations etc. is missing
5. There is room for assumptions - different users will eventually come up with different results

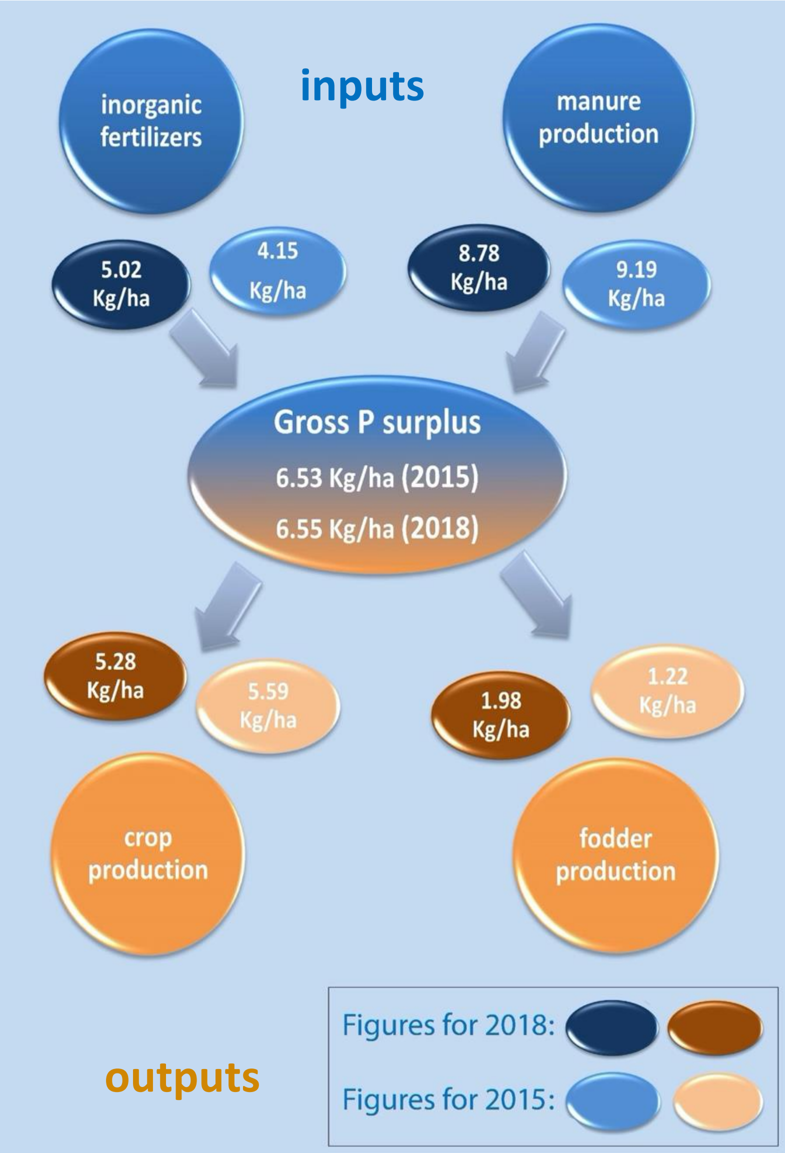
Suggestions:

1. The methodology should be simplified (reduce uncertainties)
2. Specific guidelines about its implementation should be given



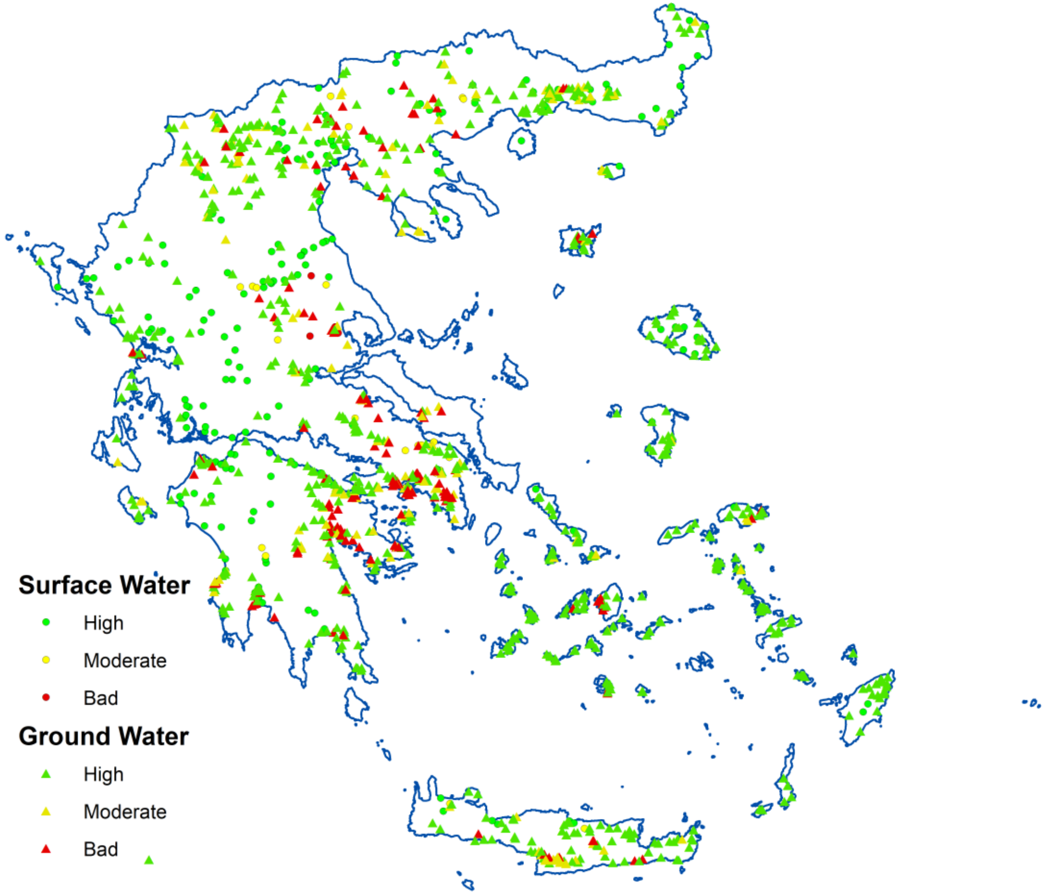
Gross Nitrogen surplus decreased between 2015 and 2018

Gross Phosphorus surplus remained practically unchanged



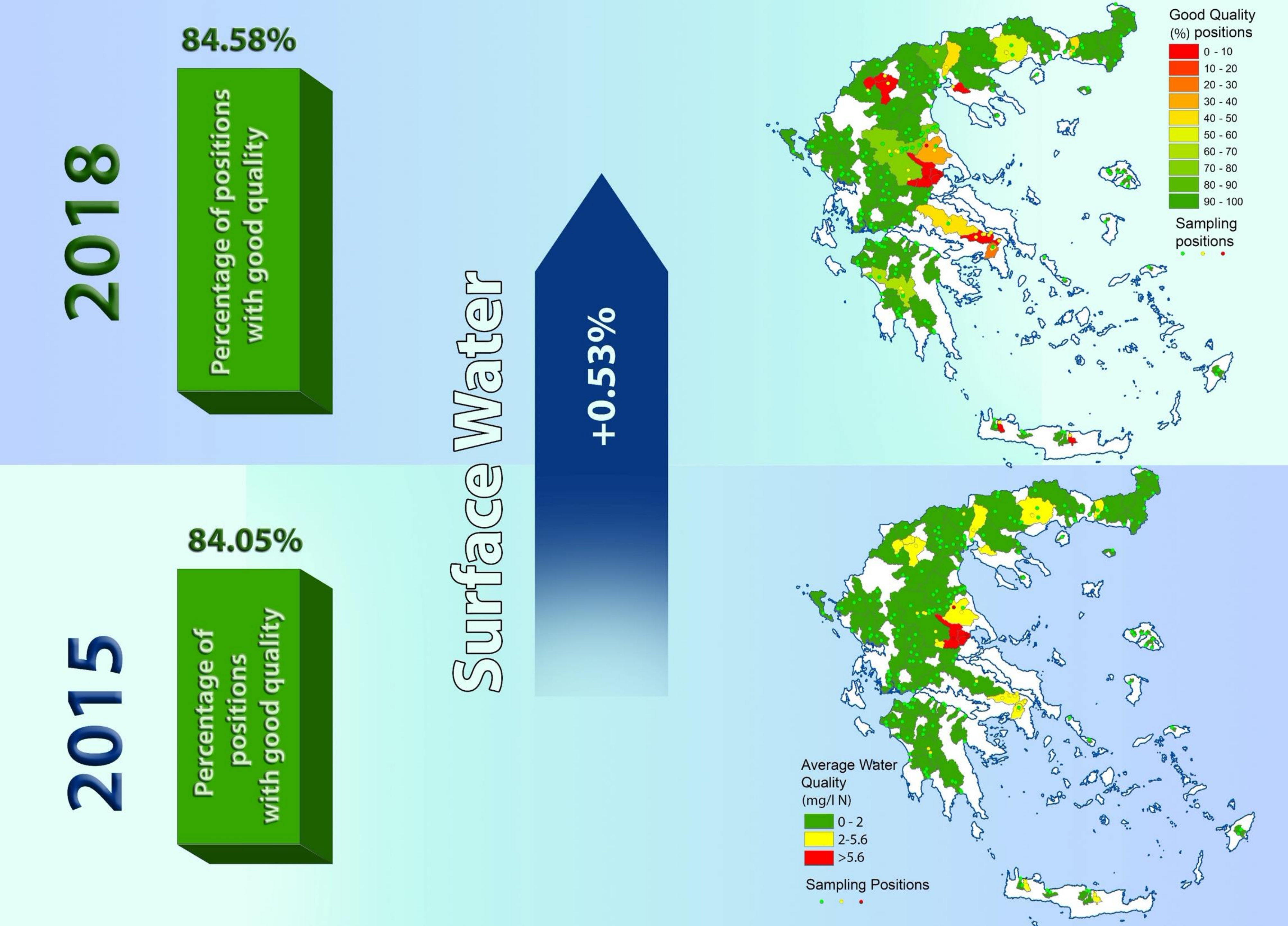
I.11 Nitrates in freshwater - Methodological approach applied in Greece

- Data of the **National Water Monitoring Network of the Ministry of Environment and Energy** were used to evaluate nitrate concentrations in surface
- The percentages of monitoring positions belonging to three quality classes for surface and water for 2015 and 2018 were estimated



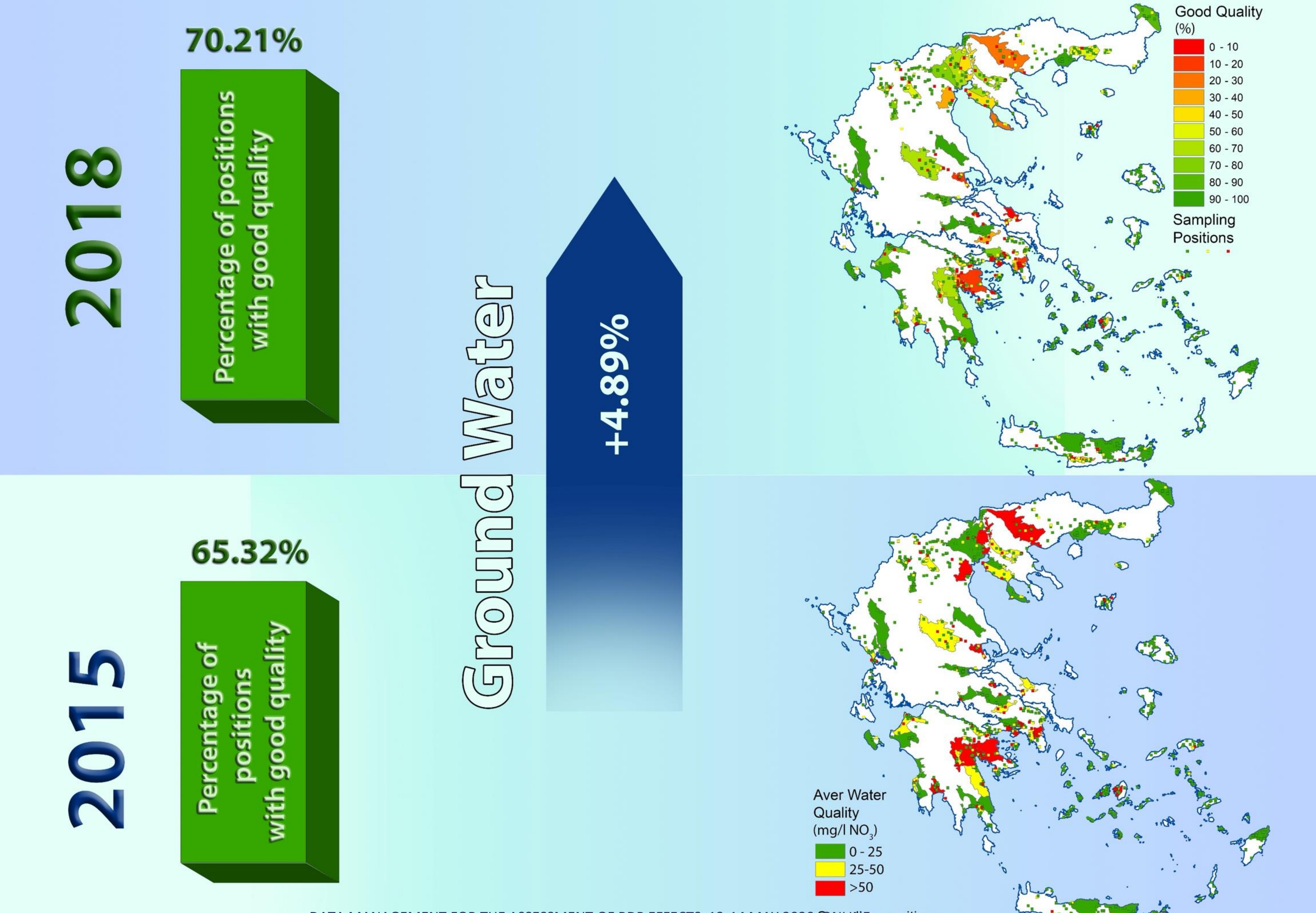
Surface water “no significant change”

Sub-indicator 2.a “Quality of **surface water**: % of monitoring positions belonging to three quality classes” showed **no significant change** in 2018 compared to 2015



Ground water "Increase in high quality positions"

Sub-indicator 2.b "Quality of **ground water**: % of monitoring positions belonging to three quality classes", a **moderate (4.89%) increase in high quality positions** and a corresponding decrease in moderate and bad quality positions were observed



Key issues:

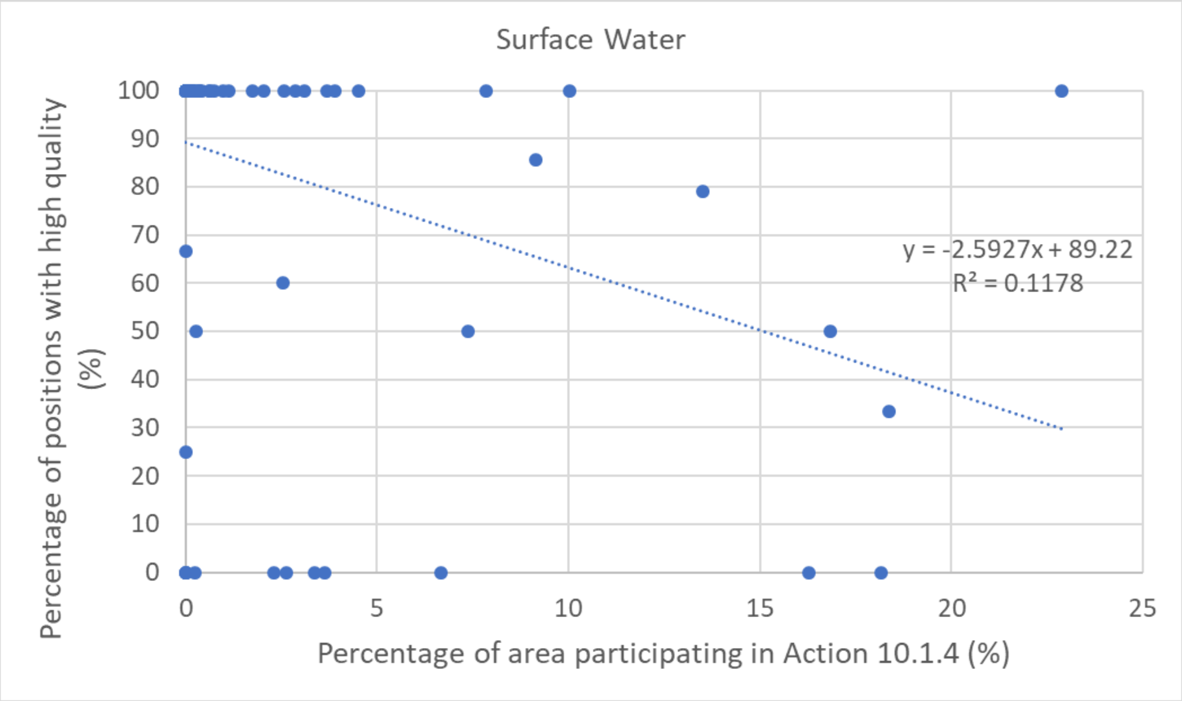
1. Small changes in indicators
2. Very weak correlations with actions

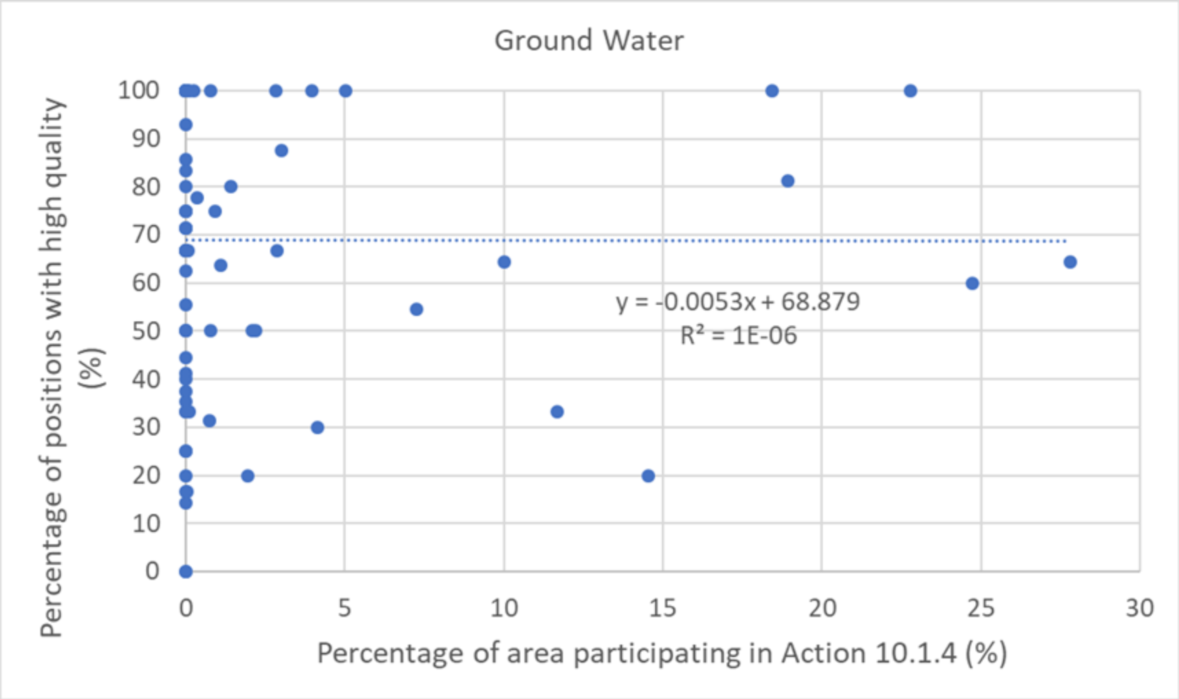
Possible Causes:

1. In areas with low water quality there is a predominantly participation in relevant Actions
2. The involved processes related with water pollution are complicated
3. Other uses also affect water quality
4. Very long time is needed for the system to respond to crop changes
5. Sampling positions located in different layers (representativeness of sampling positions)

Suggestions:

1. Detailed and systematic analysis in targeted pilot study areas





Background / Context
Water abstraction - Greece

Impact indicators covered

I.10 – “Water abstraction in agriculture”

The indicator I.10 refers to the volume of water, which is applied to soils for irrigation purposes

I.10 – “Water abstraction in agriculture” Modelling approach applied in Greece

- **According to the Impact indicator fiches**[1], the most appropriate data source so far is the **Eurostat Survey on Agricultural Production Methods; however, these data are available only for 2010**. (Problem)
- **Measured data sources used in many countries are unclear** given the **lack of related monitoring infrastructure** in local water distribution authorities or metering devices in individual farms. (Problem)
- At this moment, **the use of models estimating the volume of water used in agriculture on the basis of farm structure survey data, annual crop statistics and meteorological data, seems to be the most suitable methodology** fulfilling the evaluation quality criteria, at least in countries facing data scarcity (*The estimation may be produced by means of a model (art. 11 of Council Regulation (EC) No 1166/2008*)

- The solution adapted is an **entirely spatially distributed, continuous hydrological model** to provide information about irrigation water needs at parcel scale for the entire country
- The information is integrated in the spatial database of the Integrated Administration and Control System **(IACS) which is the base information** for this approach
- Other **information included in the IACS database also utilized** (e.g. irrigation system, water source, applied agri-environmental measures)
- Other key inputs are: **meteorological data**, **soil data**, land cover, relief
- Some available water abstractions data for **calibration and validation**

I.10 Results

Total water abstractions for irrigation higher in 2018

Water abstractions per cultivated area hectare slightly lower in 2018

Key Issue:

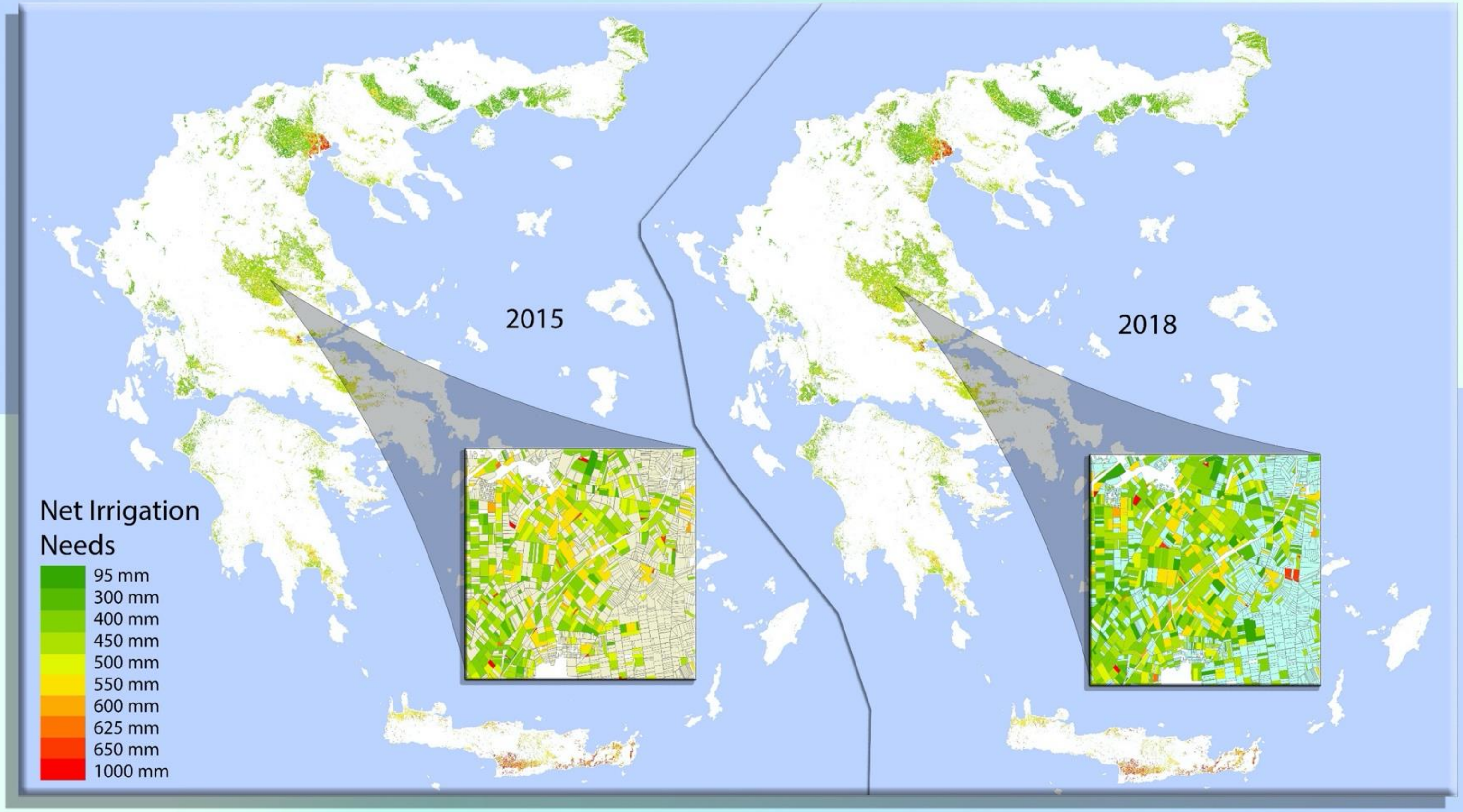
- Estimated total water abstractions considerably lower than the corresponding Eurostat estimations

Average net irrigation water needs **4,653** millions cubic meters

Total water abstractions **6,388** millions cubic meters

Average water abstractions **5,716** cubic meters per hectare

2015



2018

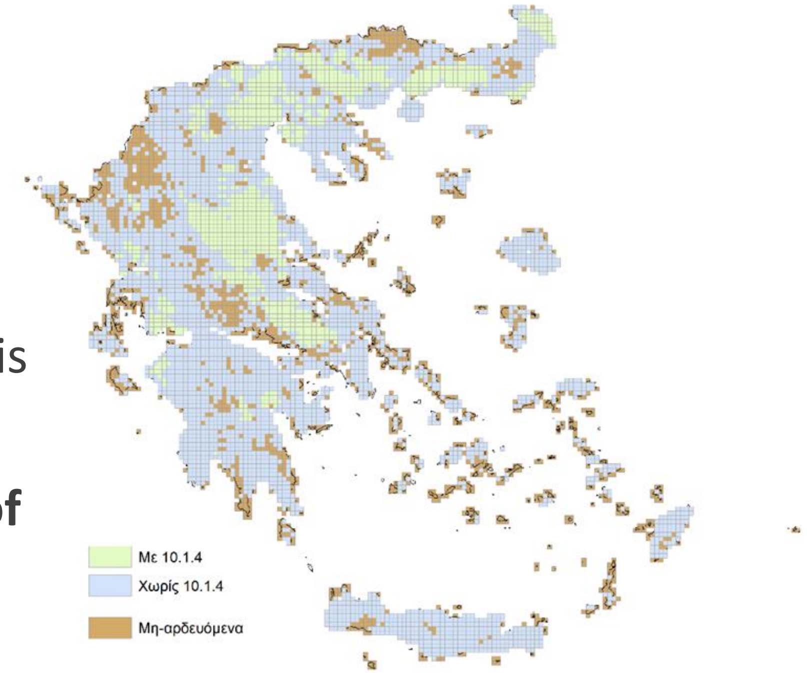
Average net irrigation water needs **4,866** millions cubic meters

Total water abstractions **6,634** millions cubic meters

Average water abstractions **5,716** cubic meters per hectare

Counterfactual statistical analysis for the evaluation year (2018)

- **Comparison of a sample of farms supported by RDP measures** (treatment group) **with a corresponding sample of not supported farms** (control group)
- Typically, the **farm is considered as the statistical unit** (decisions making level)
- **IACS spatial database provided information only at parcel level without any farm-level information** (i.e. from which parcels a farm is consisted of)
- To overcome this limitation **a canvas was created and the squares of this canvas were considered as the statistical units**
- **Matching pairs were created based on predefined characteristics** (treatment and control squares with same characteristics)



Key issues:

1. Information in IACS at parcel level (no farm identifier)
2. Different polygons and codes for the parcels in IACS each year (interannual comparisons not feasible)
3. Some agricultural areas not included in IACS database (area included in IACS differs each year)

Suggestions:

1. Include a farm code in IACS database
2. A link with the Cadastre (land registry) or/and a constant base/background
3. Inclusion of all the agricultural land in IACS

Results

Water abstractions in agriculture reduced by 618.71 m^3 / ha as a results of RDP measures

1. This significant change seems to be related with the change in crop structure due to RDP actions
2. The most recognizable effect of the RDP actions is the decrease in the areas cultivated with cotton and the increase in the areas cultivated with legumes

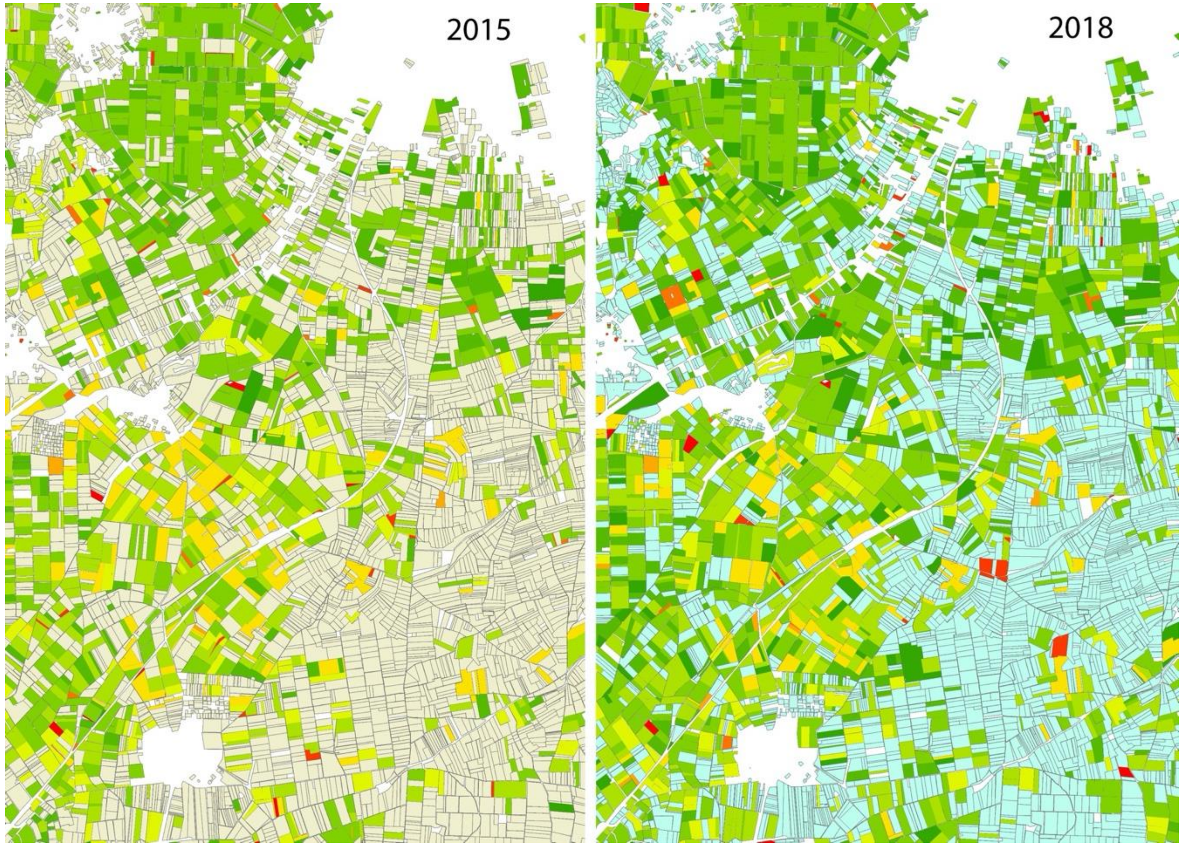
Observations (squares)	m^3/ha irrigated land	Standard deviation	Minimum	Maximum	Number of Observations
With 10.1.4	**4109.818**	683.8586	2135.381	6486.974	1044
Without 10.1.4	**4728.531**	1127.514	1071.2	10723.1	3853

Other issues identified (IACS)

1. **Lack of metadata / documentation** for IACS spatial database *(some of the cultivation codes, meaning of more than one cultivation code for one parcel, **not clear if parcels were "irrigated" or "irrigable"**)*

2. Information in IACS database about "irrigation system" and "water source" wasn't available for all the years

3. Problems with the communication with the authority handling IACS (accessibility issues)



Key issues identified: Eurostat data

1. The **data included in the Eurostat database regarding Agri-environmental indicators** (AEIs), that would be the base for the evaluation are in most cases **irrelevant or missing**
2. There is also a **big delay** in the available data and data collection level is in most cases **only national**
3. **Different figures for the same quantity** (e.g. number of animals) in different parts of the database
4. The **data reported for gross nutrient balance cannot be verified** based on the input data and the methodology reported in Eurostat

Other issues identified: Other data sources

1. The **main problem is related with the meteorological data** (very **limited accessibility especially for recent data**)
2. The soil map is very good but there are **still agricultural areas that are not covered**
3. Detailed **spatial data about irrigation infrastructures and other land reclamation projects are missing**
4. The **water abstractions for irrigation (e.g. in collective irrigation networks) even in the rare cases that are recorded are not easily available. Data quality also an issue**
5. CORINE does not provide sufficient resolution and accuracy on agricultural areas and **a very high percentage of the area is characterized by complex patterns (crops/natural vegetation)**

Recommendations for the ex-post and beyond

IACS

1. Metadata / Documentation / Openness
2. Include a farm identifier code in IACS database
3. Interannual comparisons are really important in the evaluation (a constant base is needed)
4. Distinguishing actually irrigated and irrigable parcels (equipped)
5. Inclusion of all the agricultural land in IACS
6. Any additional information in IACS is a plus

Recommendations for the ex post and beyond

EUROSTAT

1. Improvements in data related to agri-environmental indicators
2. Provide information at regional level
3. Reduce the delay in data availability

General

1. Simplify the methodology of the gross nutrient balance and provide specific guidelines about its implementation
2. **Improving communication** with organizations handling the data and facilitate data acquisition (**openness**)
3. **Detailed and systematic analysis in targeted pilot study areas**

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