Ruimtevaartthema‘s in je mbo lessen

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Planet Change

- MBO studenten
- 19 lesactiviteiten over duurzaamheid en ruimtevaart
- Bewustzijn vergroten over duurzaamheid en 21st century skills trainen in de context van ruimtetechnologie.

- NL: Leidse instrumentmakers school, NEMO
- NO: Andøya Space
- ES: Instituto Astrofysica de Canarias
- PT: Virtual Campus
- IT: CRES

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Duurzaamheid en ruimtetechnologie

In de activiteit:

- Maak gebruik van aardobservatiedata
- Leer hoe iets in de ruimte werkt met toepassingen op Aarde

Thema's:

- Milieuvervuiling
- Ruimterisico's
- Landbouw
- Logistiek
- Energie-efficiëntie
- Constructies
- Klimaatverandering

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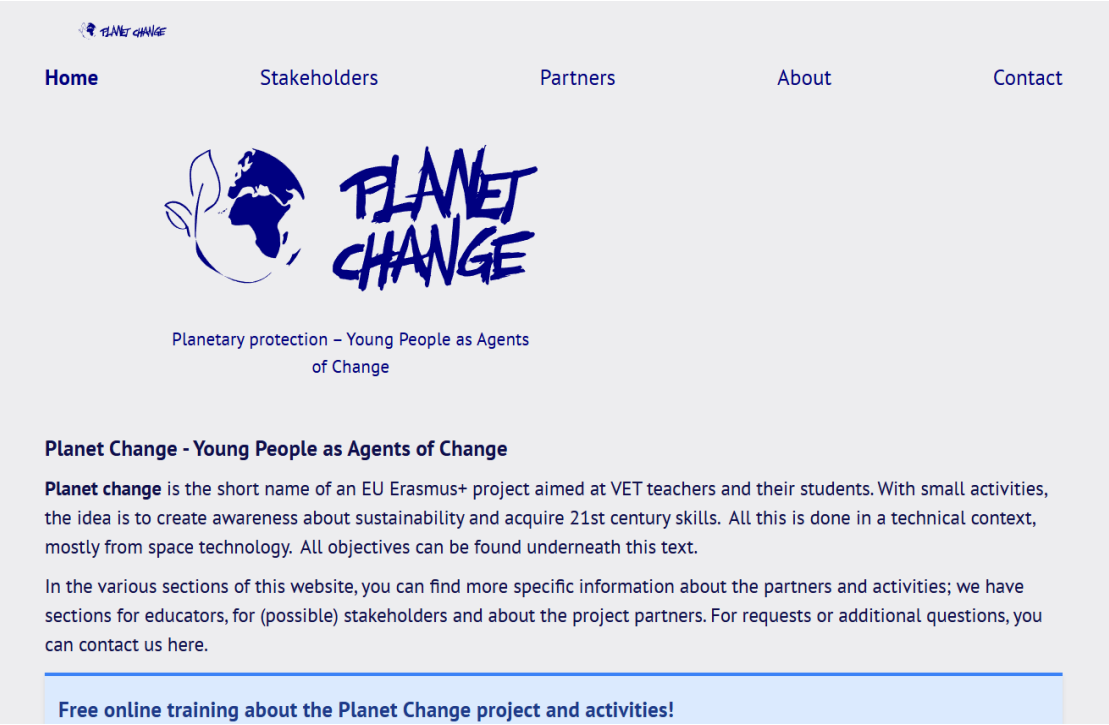
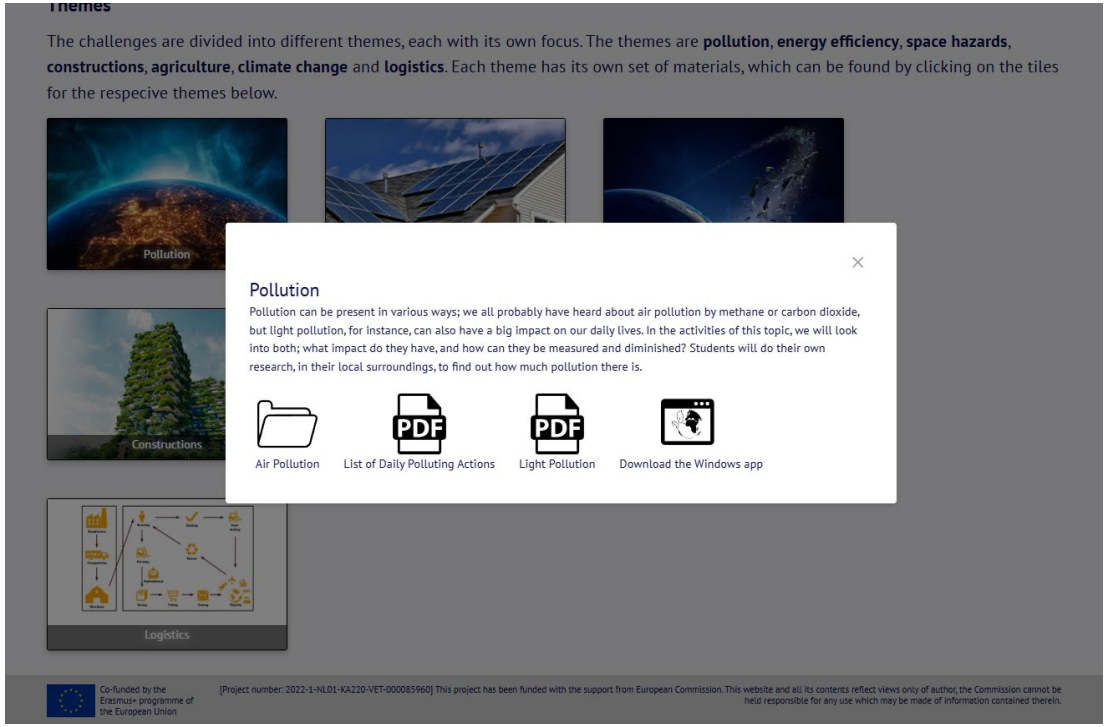
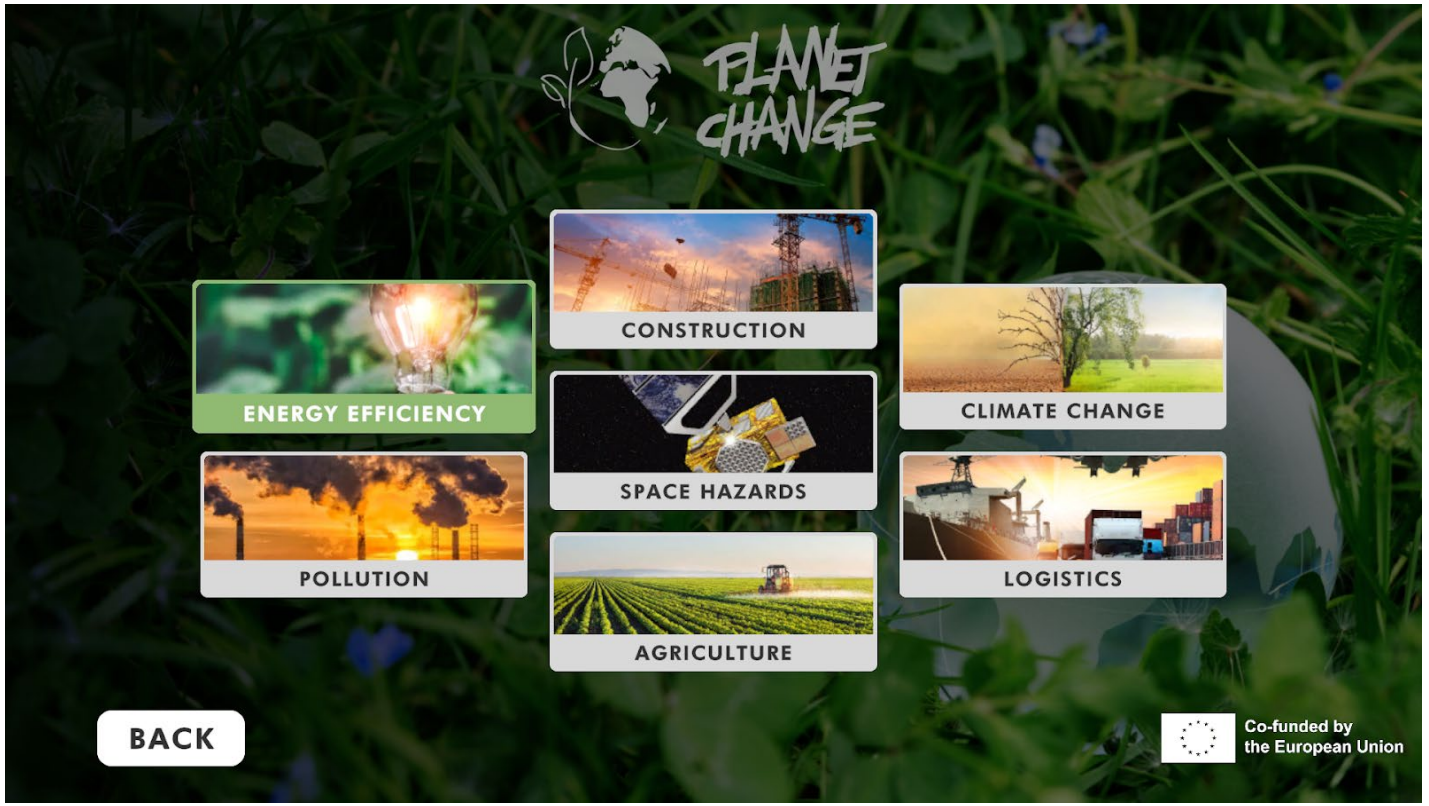
Website


Home
Stakeholders
Partners
About
Contact
PLANET CHANGE
Planetary protection – Young People as Agents of Change
Planet Change - Young People as Agents of Change
Planet change is the short name of an EU Erasmus+ project aimed at VET teachers and their students. With small activities, the idea is to create awareness about sustainability and acquire 21st century skills. All this is done in a technical context, mostly from space technology. All objectives can be found underneath this text.
In the various sections of this website, you can find more specific information about the partners and activities; we have sections for educators, for (possible) stakeholders and about the project partners. For requests or additional questions, you can contact us here.
Free online training about the Planet Change project and activities!


Themes
The challenges are divided into different themes, each with its own focus. The themes are pollution, energy efficiency, space hazards, constructions, agriculture, climate change and logistics. Each theme has its own set of materials, which can be found by clicking on the tiles for the respecive themes below.
Pollution
Constructions
Logistics
Pollution
Pollution can be present in various ways; we all probably have heard about air pollution by methane or carbon dioxide, but light pollution, for instance, can also have a big impact on our daily lives. In the activities of this topic, we will look into both; what impact do they have, and how can they be measured and diminished? Students will do their own research, in their local surroundings, to find out how much pollution there is.
Air Pollution
List of Daily Polluting Actions
Light Pollution
Download the Windows app
Co-funded by the Erasmus+ programme of the European Union
[Project number: 2022-1-NL01-KA220-VET-000085960] This project has been funded with the support from European Commission. This website and all its contents reflect views only of author, the Commission cannot be held responsible for any use which may be made of information contained therein.

Multimedia activiteiten



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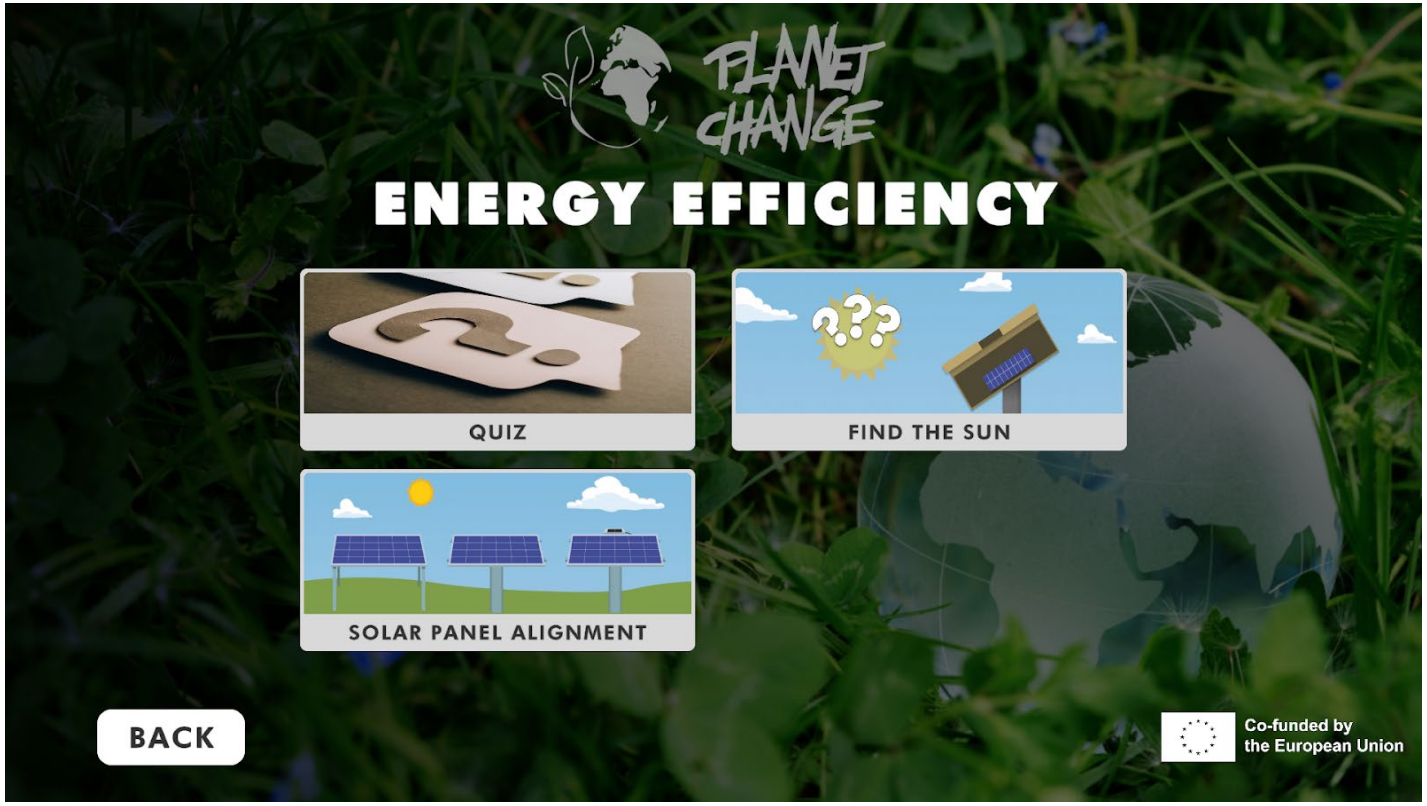
Multimedia activiteiten



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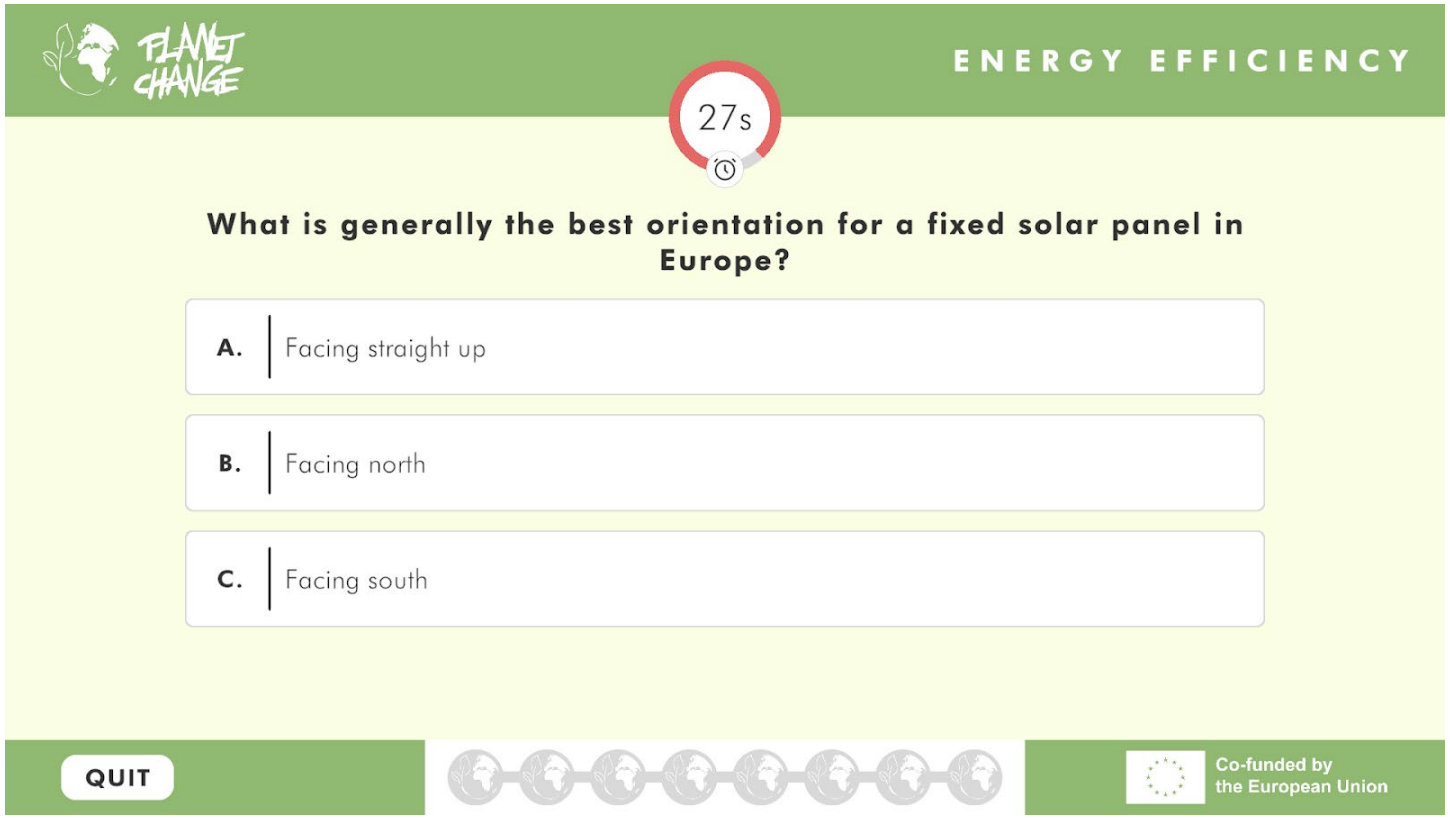
Multimedia activiteiten

- **Quiz**
- Simulatie
- Spel



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Multimedia activiteiten

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- **Simulatie**
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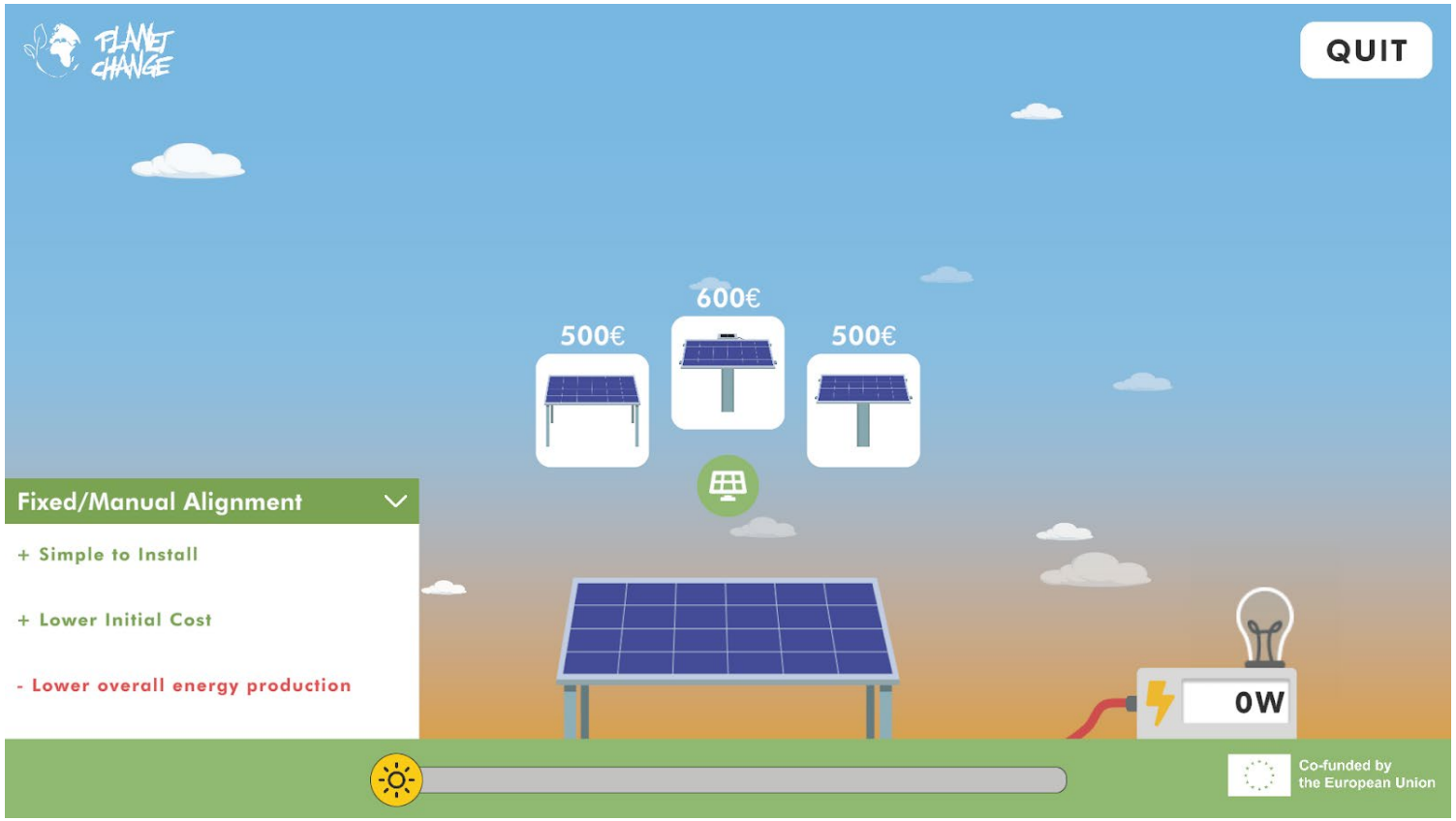

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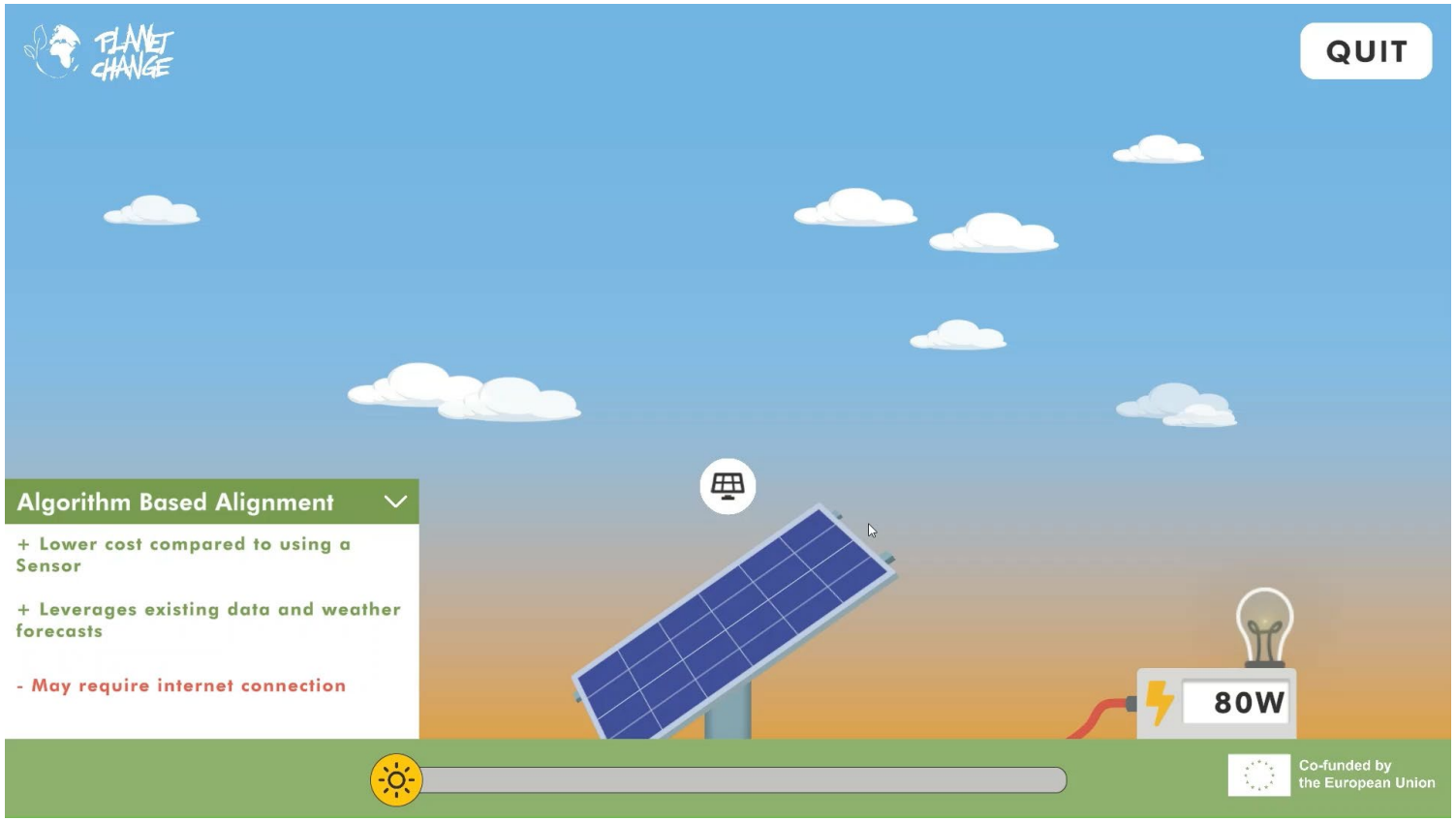
Multimedia activiteiten

- Quiz
- **Simulatie**
- Spel



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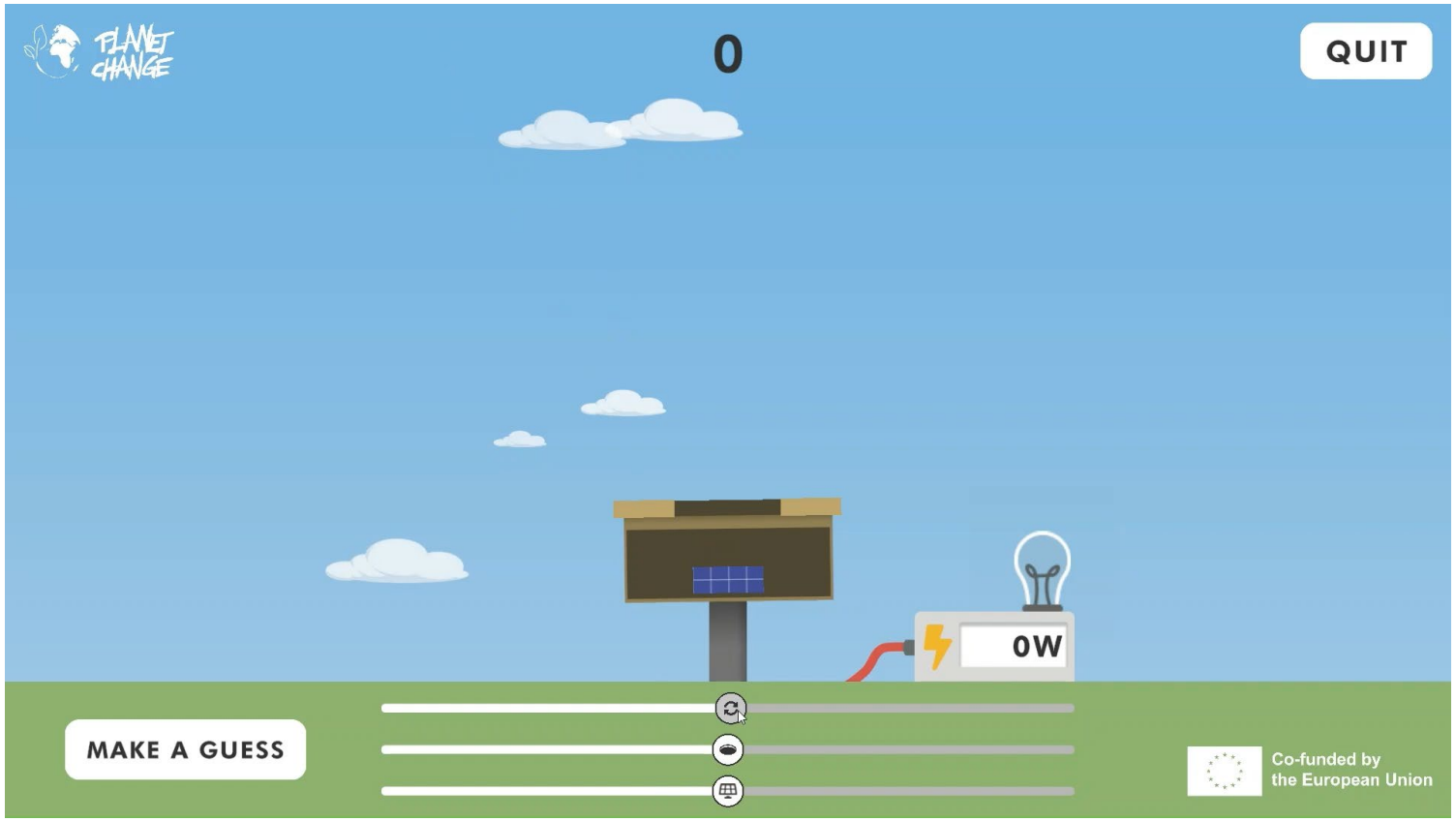
Multimedia activiteiten

- Quiz
- Simulatie
- **Spel**



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Vandaag

- Onderzoek je luchtvervuiling
  - Maak gebruik van aardobservatie

- Hoe werkt GNSS?
  - Leer hoe iets in de ruimte werkt met toepassing op Aarde

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Hoe monitor je luchtvervuiling met satellieten?

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Satellieten in de ruimte

Onderzoek de stikstofdioxide-uitstoot (NO_2)

Bekijk de uitstoot van andere broeikasgassen

- Hoe vervuild is Nederland?

- Wat zijn de grootste emissies?

- Wat zou de reden hiervoor kunnen zijn?

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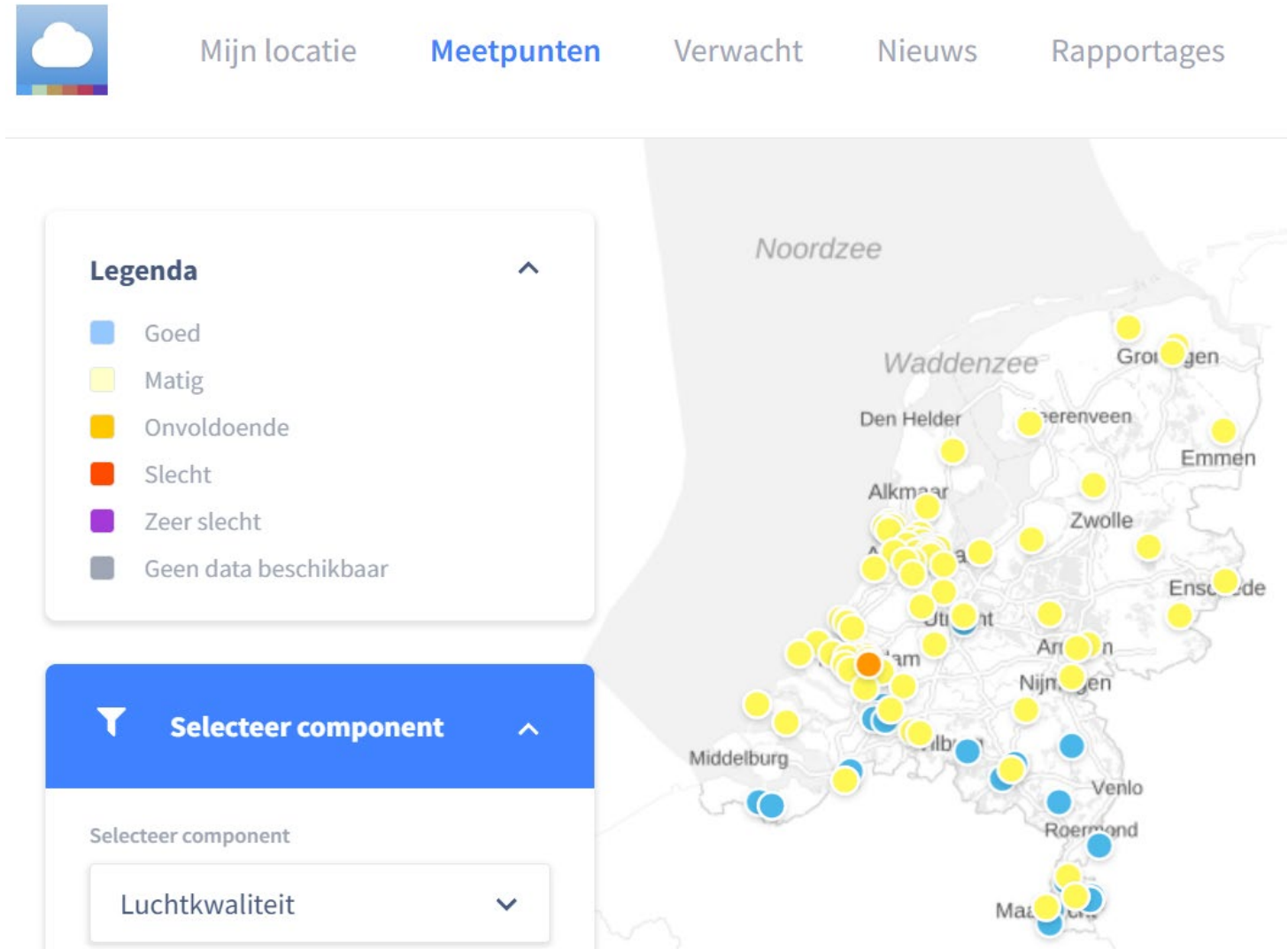

Metingen aan de grond
Luchtmeetnet.nl

Opgehaald op 10-1-2025

Co-funded by the
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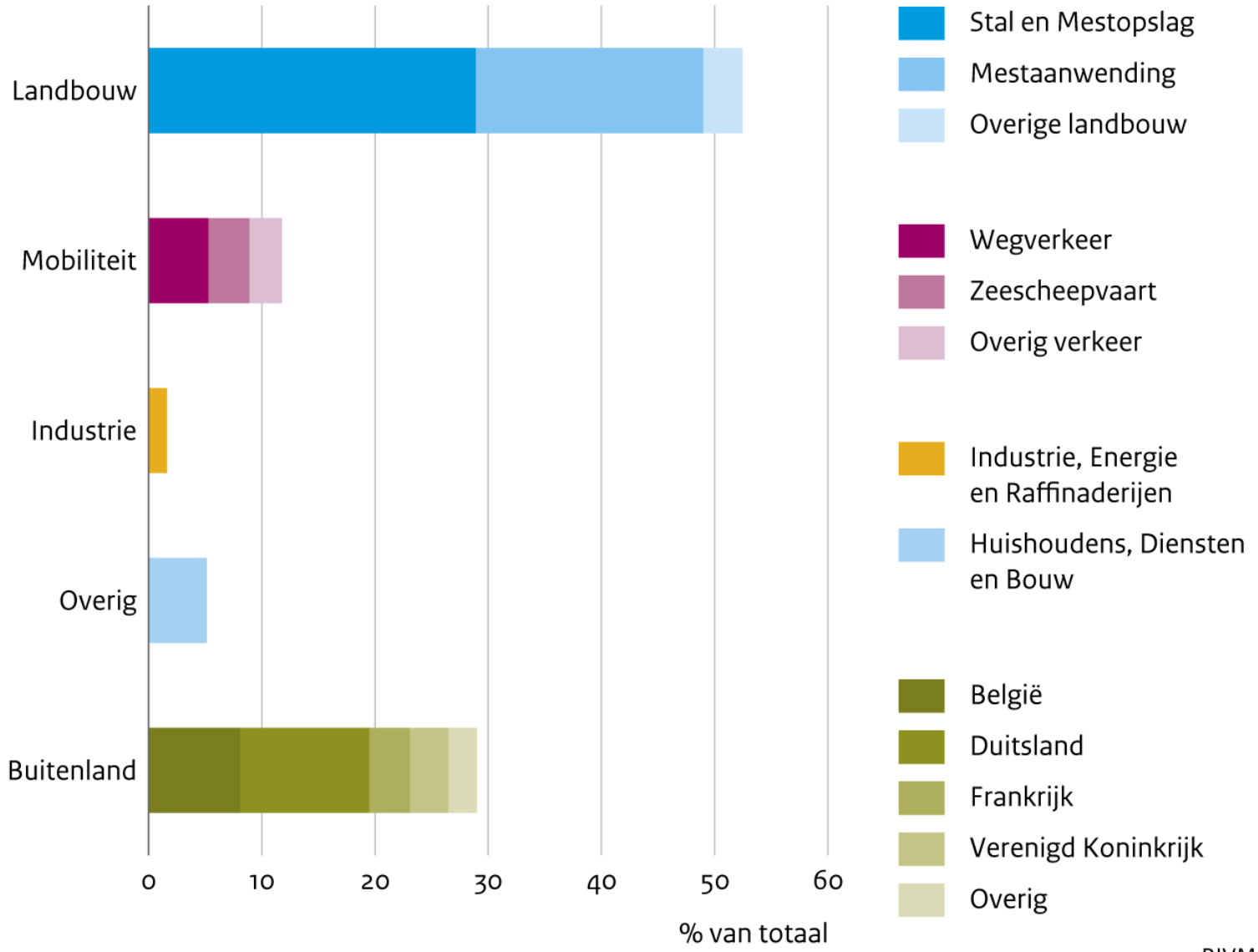
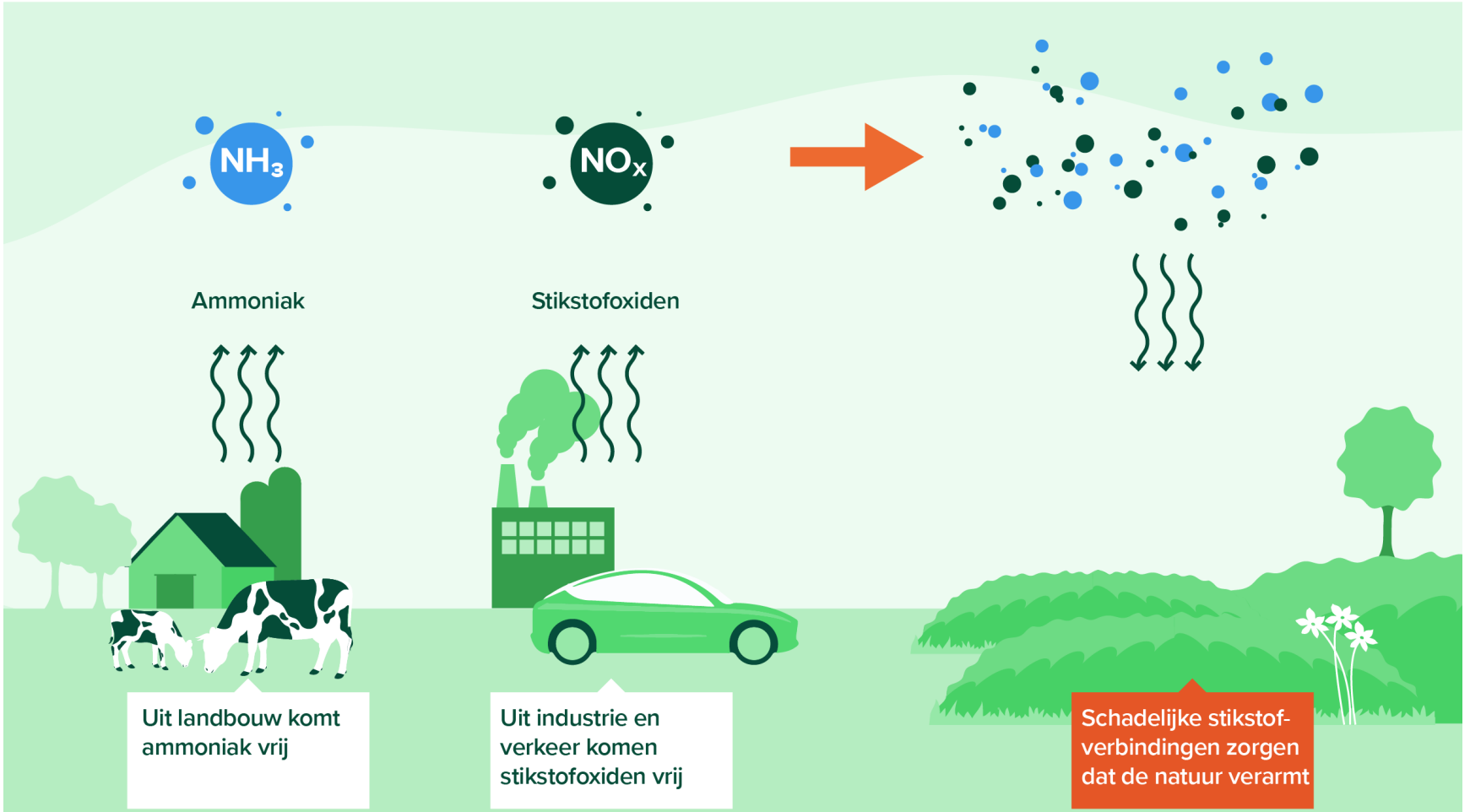
Herkomst stikstofdepositie in Nederland gemiddeld, 2022



Bron: RIVM 2023

RIVM/dec23
www.clo.nl/nl050714

WAT ZIJN SCHADELIJKE STIKSTOFVERBINDINGEN?



milieu centraal

PLANET CHANGE

Luchtvervuiling in het dagelijks leven

- 12 kaartjes
- Deel onder in categorieën
- Hoe kan je deze actie duurzamer maken?

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Benzineauto’s en -motoren	Elektriciteit uit fossiele brandstoffen	Activiteiten die fijnstof veroorzaken	Producten die chemicaliën in de lucht brengen	Consumpties en dagelijkse gewoonten

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Training
Hoe werkt GNNS?

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www.planetchange.eu

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GNSS

What is GNSS?

- Global Navigation Satellite System

What is GNSS?

Naam	Owner	Satelli
GPS (Global positioning system)	United States	27
GLONASS	Russia	24
BEIDOU	China	35
GALILEO	Europe	24 (+6)
NAVIC	India	7
QZSS	Japan	4

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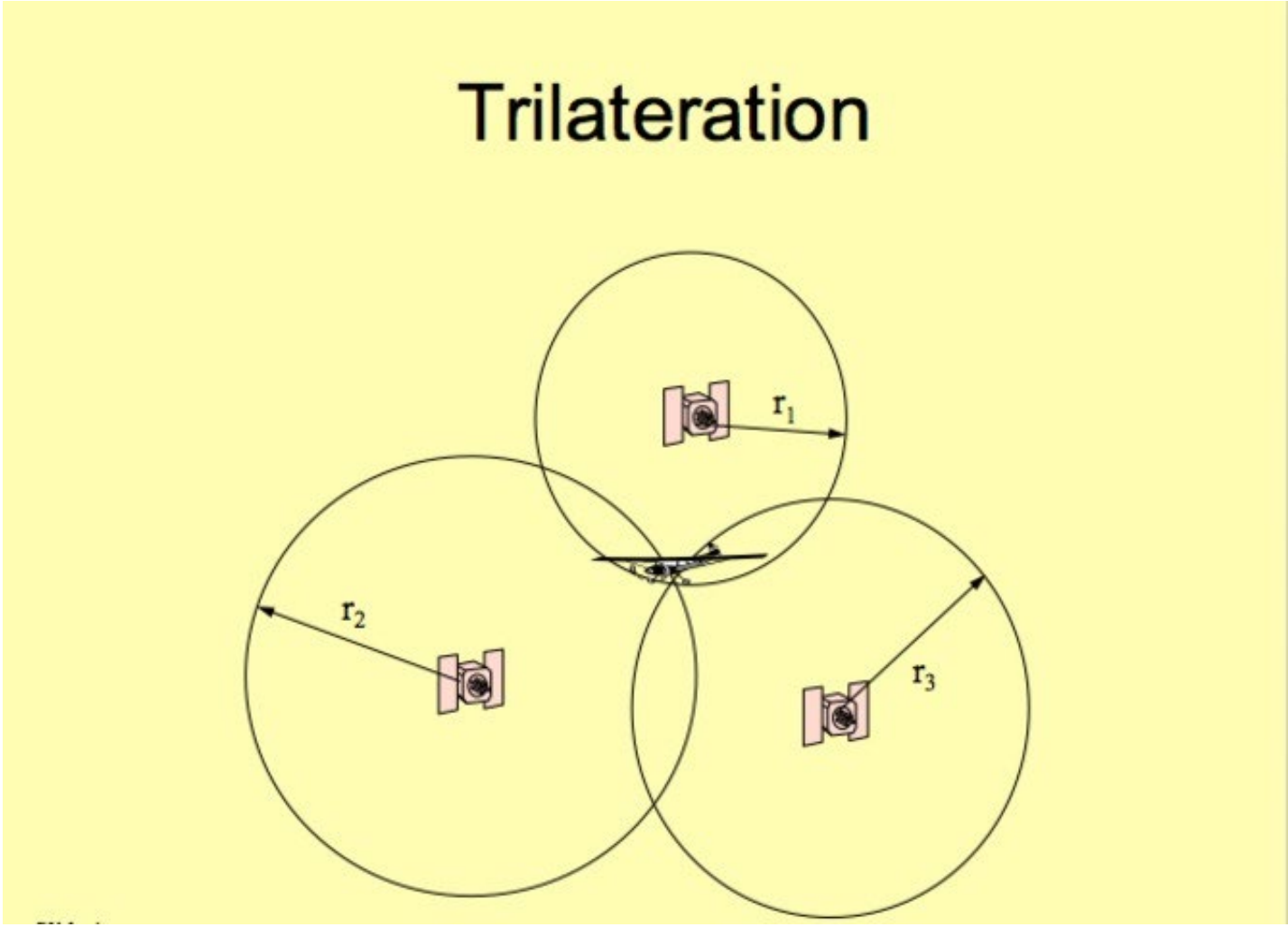
We try now ourselves!



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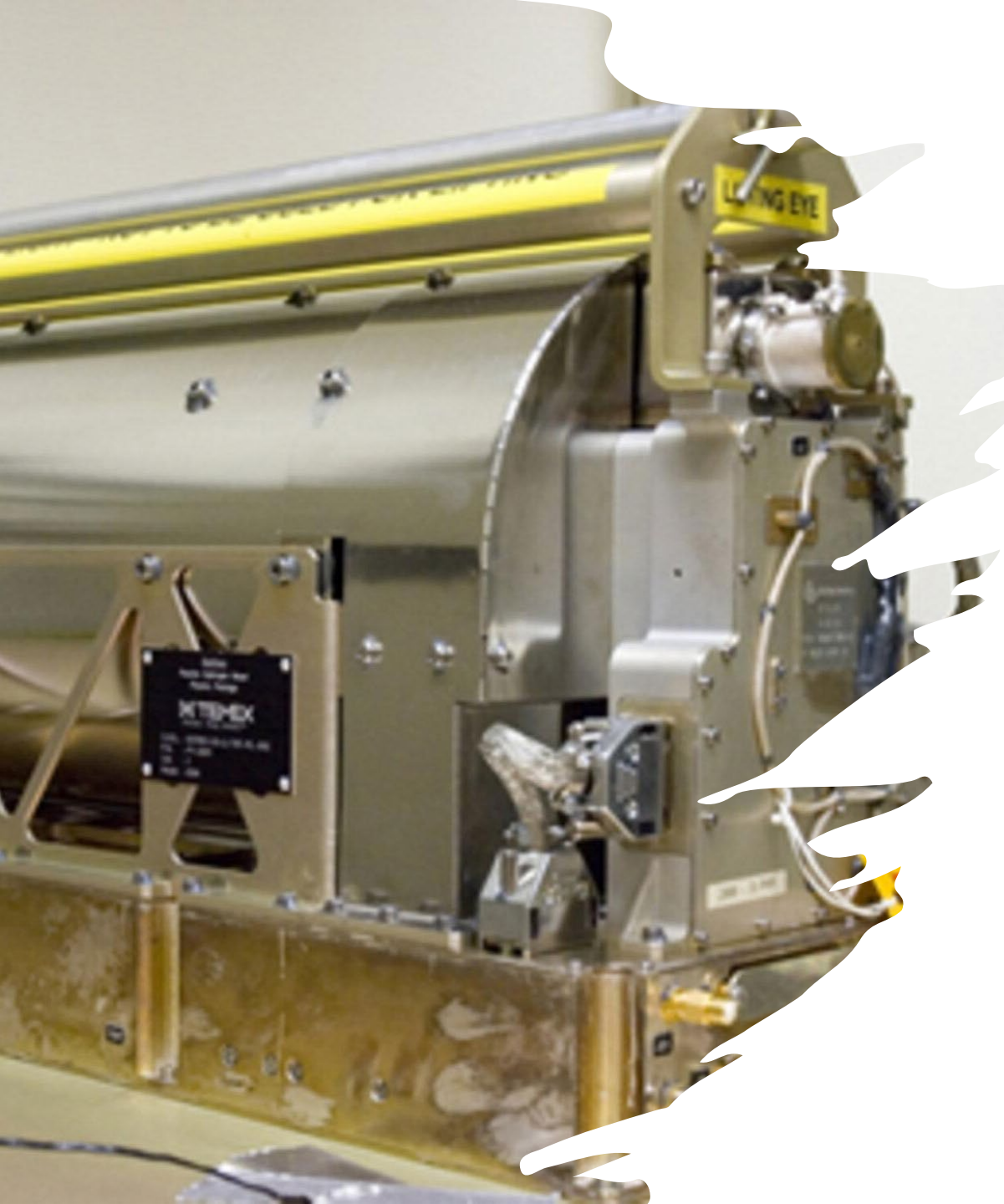
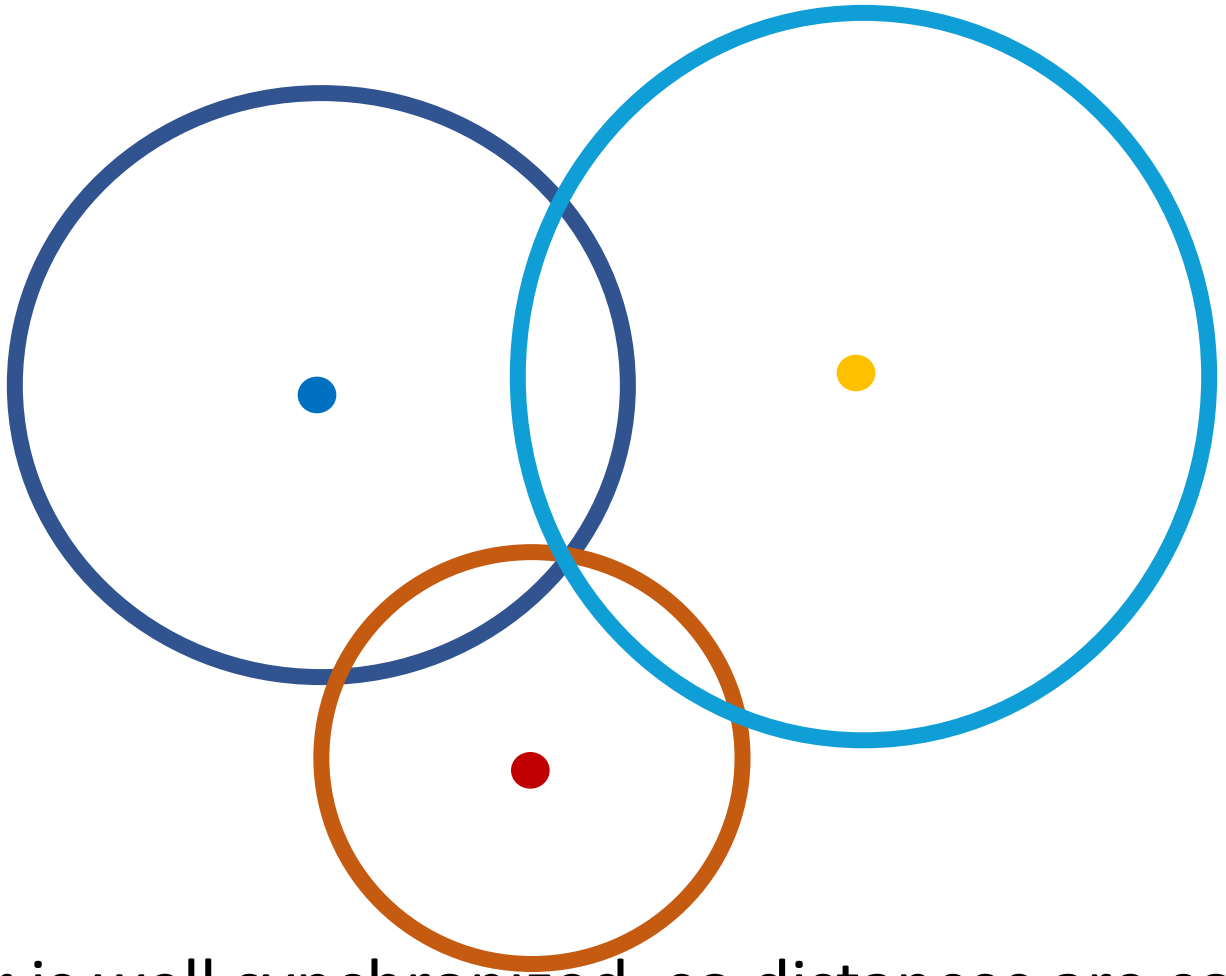


Accurate timing

- Why do we need accurate timing?
  - Speed of light is 299 792 548 m/s,
  - A difference of 1 microsecond (=0,000001 second) corresponds already with 300m difference, for navigation this is a problem
  - So very accurate clocks are necessary.
  - Galileo is accurate to 1 nanosecond (=0,000000001 second), which corresponds to 30 cm.

How to achieve this accurate timing?

- Your mobile device is not an atomic clock
- How to achieve accurate timing?
  - Use a fourth satellite
  - Use 4 trilateration calculations by using:
    - Satellite A, B, C
    - Satellite A, B, D
    - Satellite A, C, D
    - Satellite B, C, D
  - All calculations should come up with the same position, this can be achieved by changing the timing of the receiver.



Receiver is well synchronized, so distances are correct.

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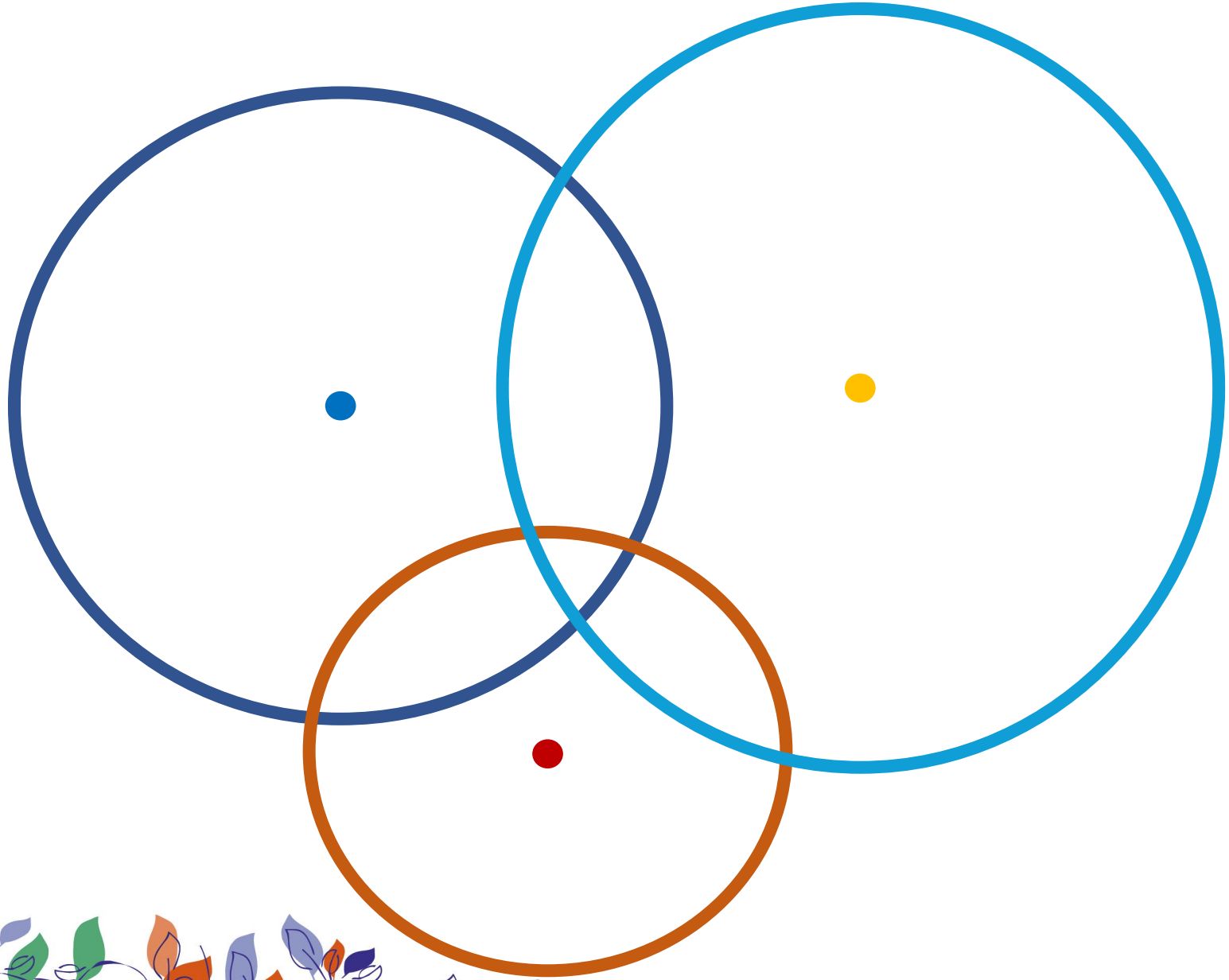

Receiver is a bit ahead in timing, so it looks like that signals have traveled more time than they have, so distances are too large.

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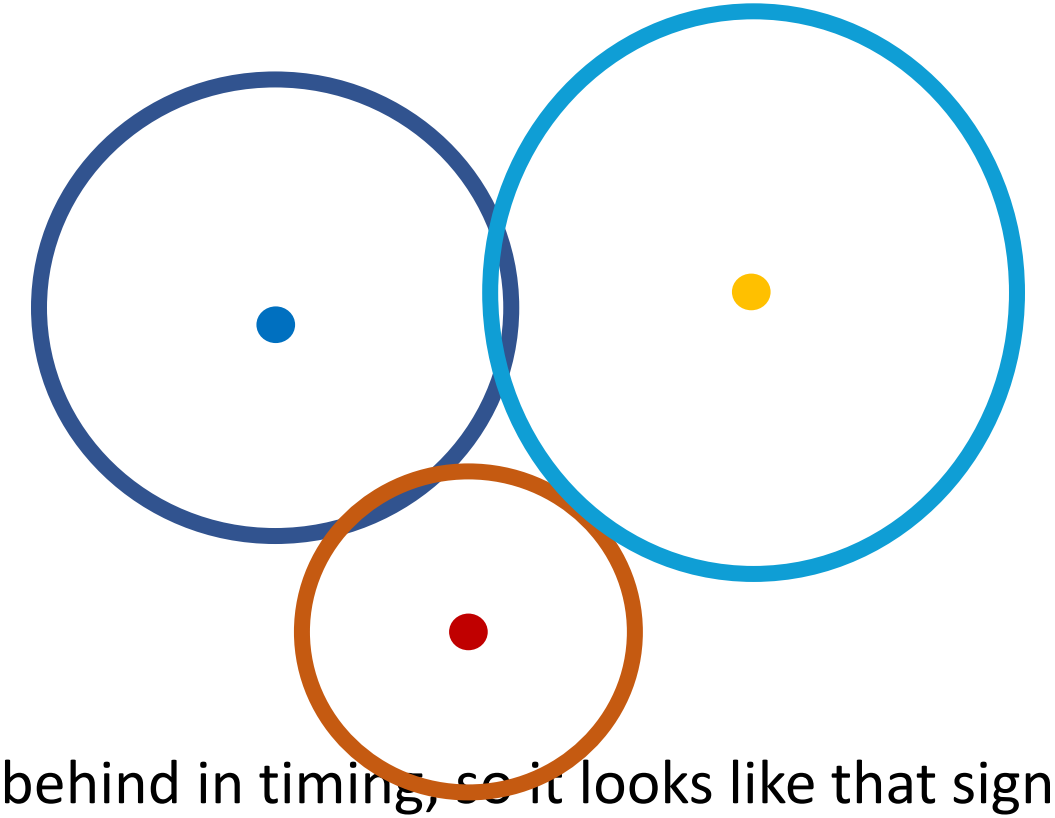

Receiver is a bit behind in timing, so it looks like that signals have traveled less time than they have,so distances are to small.

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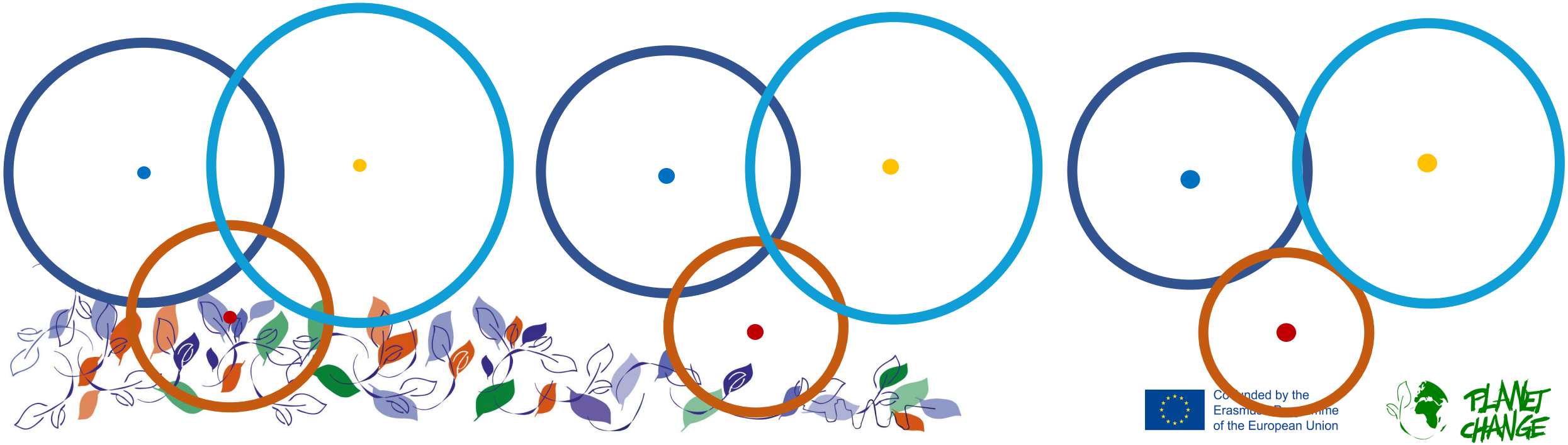
Adjust the timing



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How to achieve this accurate timing?

- Your mobile device is not an atomic clock
- How to achieve accurate timing?
  - Use a fourth satellite
  - Use 4 trilateration calculations by using:
    - Satellite A, B, C
    - Satellite A, B, D
    - Satellite A, C, D
    - Satellite B, C, D
  - All calculations should come up with the same position, this can be achieved by changing the timing of the receiver.
  - The fourth satellite is effectively used to calibrate the timing
- Note that the timing is so precise that all kinds of general relativity effects need to be taken into account

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Uses of GNSS

1. Location
   – determining a position
2. Navigation
   – getting from one location to another
3. Tracking
   – monitoring object or personal movement
4. Mapping
   – creating maps of the world
5. Timing
   – bringing precise timing to the world

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Where will it be used

- Agriculture
- Aviation
- Environment
- Marine
- Public Safety & Disaster Relief
- Rail
- Recreation
- Roads & Highways
- Space
- Surveying & Mapping
- Timing

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How important is timing?

- Discuss it in groups of 5 for 5-10 minutes
- Come up with the results:
  1. Banking transactions (including ATM's)
  2. Electricity grid synchronization of the changing voltage
  3. Communication systems
  4. Synchronized timing of scientific instruments
  5. Film business (Hollywood studios are incorporating GPS in their movie slates, allowing for unparalleled control of audio and video data, as well as multi-camera sequencing.)

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PLANET CHANGE

Vragen?

- Stel ze nu of mail naar planet-change@e-nemo.nl

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