



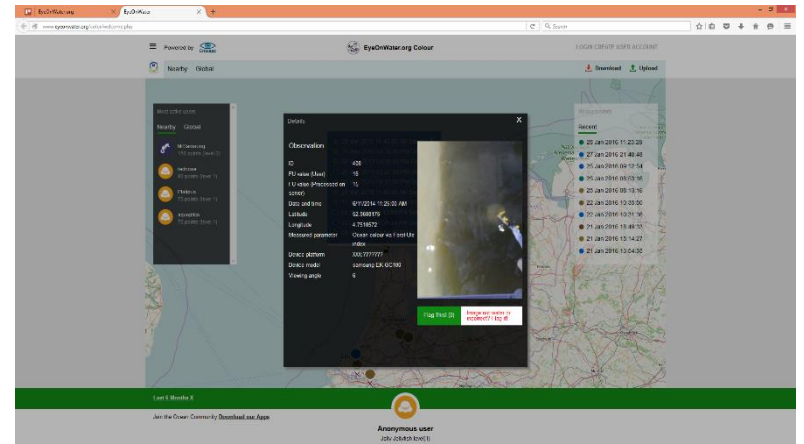
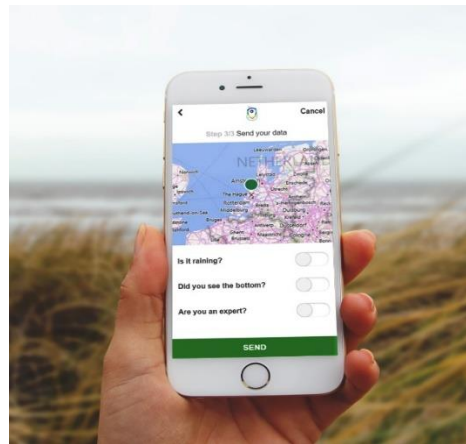
EyeOnWater

Citizen science for water quality

Peter Thijsse (MARIS)

Hans van der Woerd (VU)

Based on ideas from Marcel Wernand (NIOZ)



Koninklijk Nederlands Instituut voor Onderzoek der Zee



About citizen science

- Involving and empowering the citizen in science
- Interesting additional resource of data
- More and more initiatives pop-up
- Great way to involve and inform the public
- But:
 - Still “under-used” by research organisations
 - Quality doubts
 - Difficult to sustain, both financially as in effort
- So, it needs attention to grow.

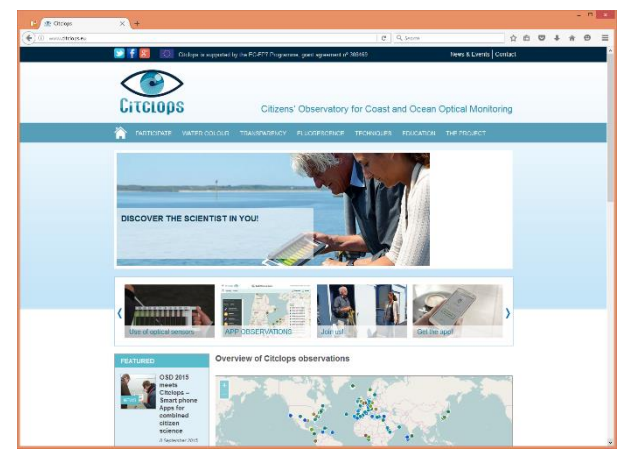


From: Advancing Citizen Science for Coastal and Ocean Research - Scientific Figure on ResearchGate.
Available from:
https://www.researchgate.net/Factors-of-success-in-Citizen-Science-projects_fig4_317179474
[accessed 7 Nov, 2018]

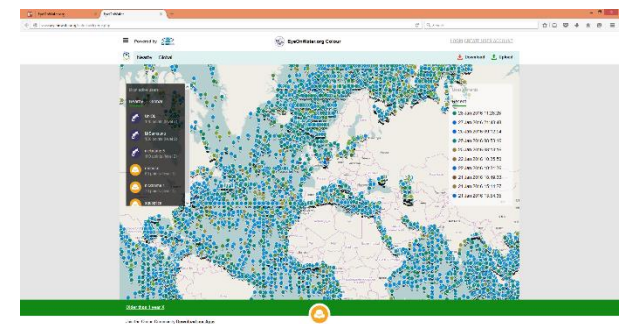


1. Background EyeOnWater

- Via observation satellites and local monitoring stations researchers monitor seas and inland waters.
- Long term data collections can be used by researchers and water managers to analyse changes in the field of a.o. marine pollution, climate change, etc.
- Regular monitoring is now being extended more and more with data collected via citizens and others. EyeOnWater concept developed for water color, recently expanded with kit for PH, Nitrate, other phenomena (waterplants, biodiversity).
- Supplies a bridge between science, government and citizens.



www.Citclops.eu



www.eyeonwater.org



2. Concept EyeOnWater-Color

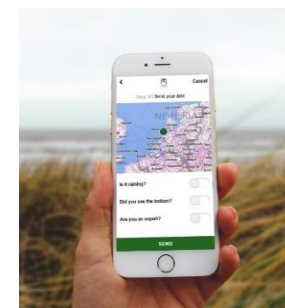
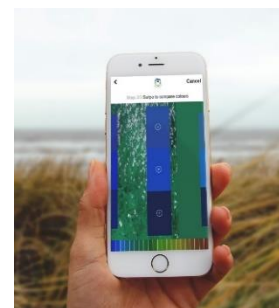
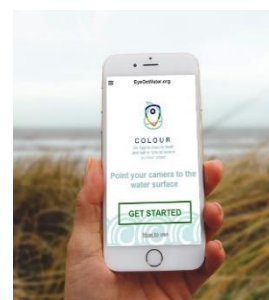
- Measuring the color of water has taken place since 1889 from ships using the Forel-Uleschale. Nowadays remote sensing provides an additional resource.
- Result from long term analysis of Forel-Ule data: Some seas and oceans get more blue (less phytoplankton), others get greener (more phytoplankton), with a different pattern over time.
- Via the EOW app as much as possible color data will be collected of natural waters by the public to increase our insight and understanding of trends worldwide.
- Concept: Collect data, store, *validate*, and share





3.1 EyeOnWater app

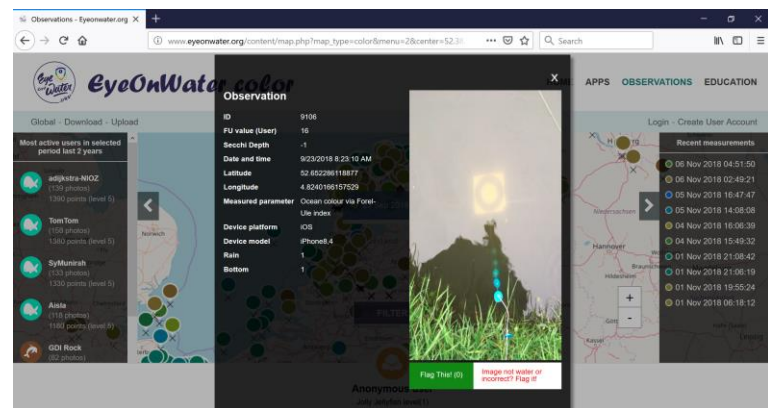
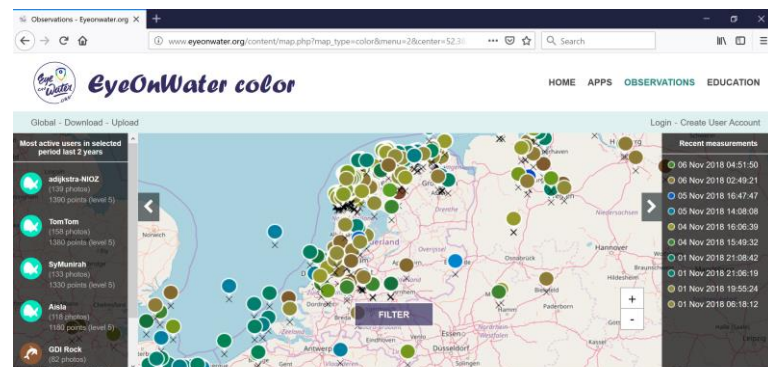
- The EyeOnWater-color App makes use of the 21 colors in the Forel-Ule scale.
- Observation proces:
 - Measure: Take an image of the water following in-app instructions
 - Compare: Color in image with FU color
 - Add information: Clouds? Bottom?
 - Send: Data will be sent to central server including metadata from the smartphone like date/time, GPS-location, lighting, angle, etc.
 - Validate: Go to www.eyeonwater.org and compare with others.
Also automatic validation on server





3.2 EyeOnWater V1 website

- www.eyeonwater.org is the central portal where all concepts are shown and all data is stored and published.
- Overview of alle observations (Color: history and app data)
- Selection in time, request details per observation, downloadable.
- Via connection of app to an EOW account user get a personal experience (view own data, ranking)
- Two validations:
 - Validation on import (WACODI using RGB analysis to compare with FU value)
 - Validation by other users via flagging of suspicious observations (emails image to expert)



Current data coverage

The screenshot displays the EyeOnWater color website interface. At the top, the browser address bar shows the URL: www.eyewater.org/content/map.php?map_type=color&menu=2¢er=35.68000000000002,8.41562500000002,3. The website header includes the EyeOnWater color logo and navigation links for HOME, APPS, OBSERVATIONS, and EDUCATION. Below the header, there are links for "Global - Download - Upload" and "Login - Create User Account".

The main content area features a world map with numerous colored markers (green, yellow, blue, brown) representing water quality observations. The markers are densely clustered in North America, Europe, and parts of Asia. A "FILTER" button is located at the bottom center of the map.

On the left side, a sidebar titled "Most active users in selected period last 2 years" lists the following users:

- adijkstra-NIOZ (139 photos, 1390 points, level 5)
- TomTom (158 photos, 1380 points, level 5)
- Aisla (118 photos, 1180 points, level 5)
- SyMunirah (105 photos, 1050 points, level 5)
- GDI Rock (82 photos, 820 points, level 4)
- JakeCC (77 photos, 760 points, level 4)

On the right side, a sidebar titled "Recent measurements" lists the following data points:

- 01 Nov 2018 06:18:12
- 01 Nov 2018 06:12:16
- 01 Nov 2018 06:04:33
- 01 Nov 2018 05:58:44
- 01 Nov 2018 05:44:15
- 01 Nov 2018 05:38:51
- 01 Nov 2018 05:34:25
- 01 Nov 2018 05:29:40
- 01 Nov 2018 05:26:42
- 01 Nov 2018 05:19:24

At the bottom left, there is a small copyright notice: "© OpenStreetMap contributors".

Active regions – Casco bay

Observations - Eyeonwater.org

www.eyeonwater.org/content/map.php?map_type=color&menu=2¢er=43.737106971372754,-70.0360275268554,12

90%

EyeOnWater color

HOME APPS OBSERVATIONS EDUCATION

Global - Download - Upload Login - Create User Account

Most active users in selected period last 2 years

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- GDI Rock (82 photos) 820 points (level 4)
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Recent measurements

- 01 Nov 2018 06:18:12
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- 01 Nov 2018 05:38:51
- 01 Nov 2018 05:34:25
- 01 Nov 2018 05:29:40
- 01 Nov 2018 05:26:42
- 01 Nov 2018 05:19:24

FILTER

+


-

9

Active region - Borneo

Observations - Eyeonwater.org X +







www.eyeonwater.org/content/map.php?map_type=color&menu=2¢er=6.113609445708832,116.18056963820317,12 90% Search

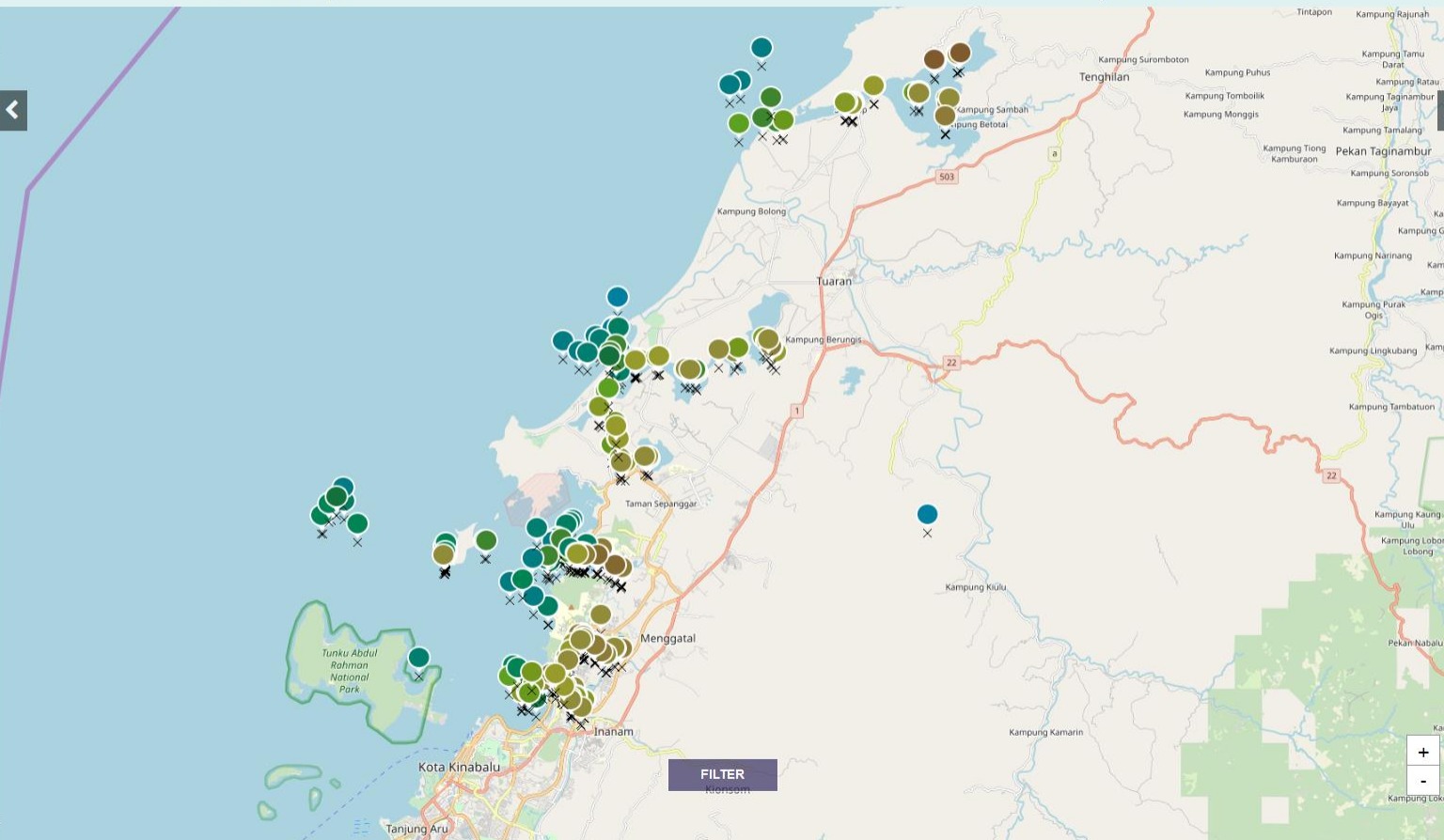
 **EyeOnWater color**

HOME APPS OBSERVATIONS EDUCATION











Global - Download - Upload Login - Create User Account

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Recent measurements

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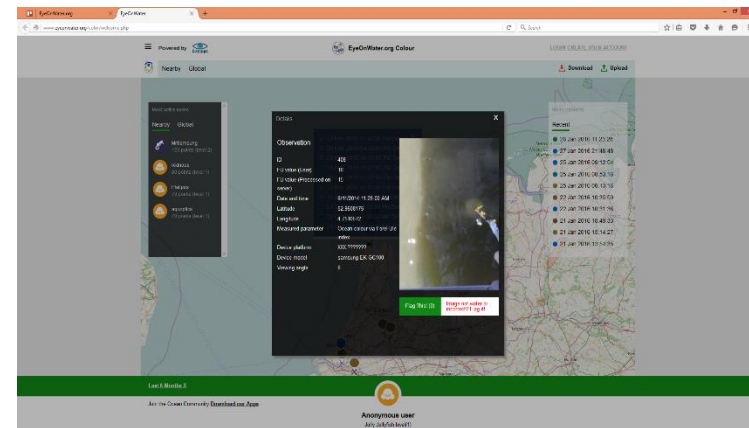
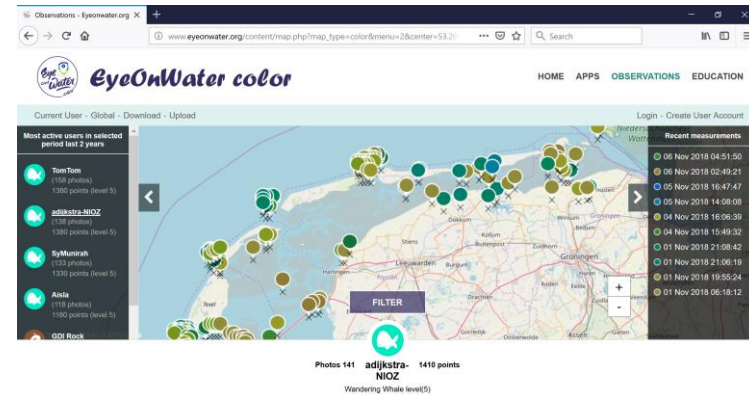
10



3.3 EyeOnWater V1 services

Current services

- Personal experience:
 - Account with nickname and email address (we know the users – do not use this yet)
 - Ranking
 - Could allow contact between users – Community feeling
- Data download service:
 - All data is public
 - Downloadable “as is”, in CSV format with images via URL’s
- Data sharing services:
 - WMS/WFS available for full dataset



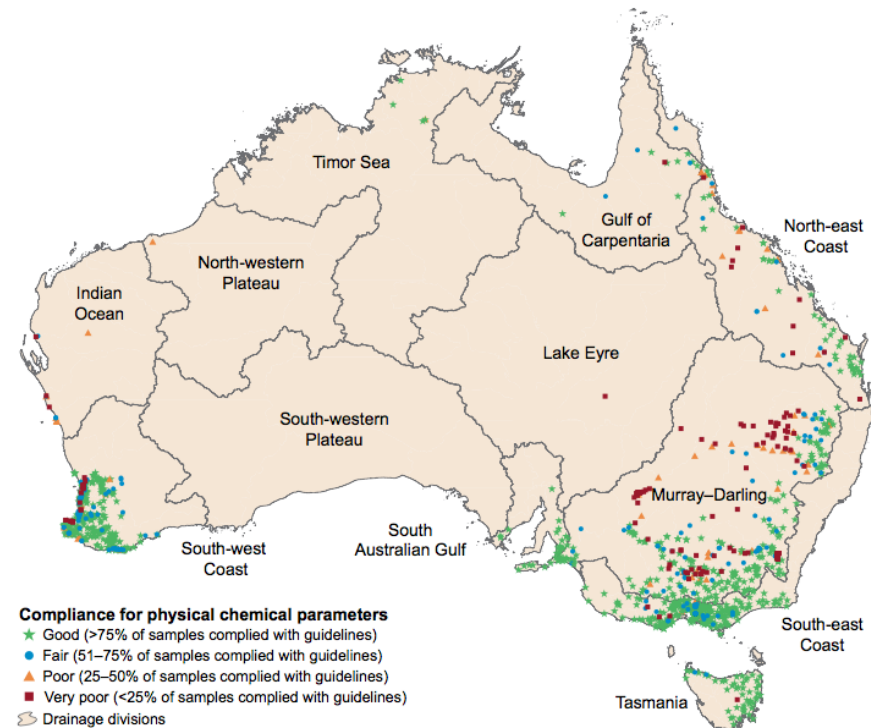
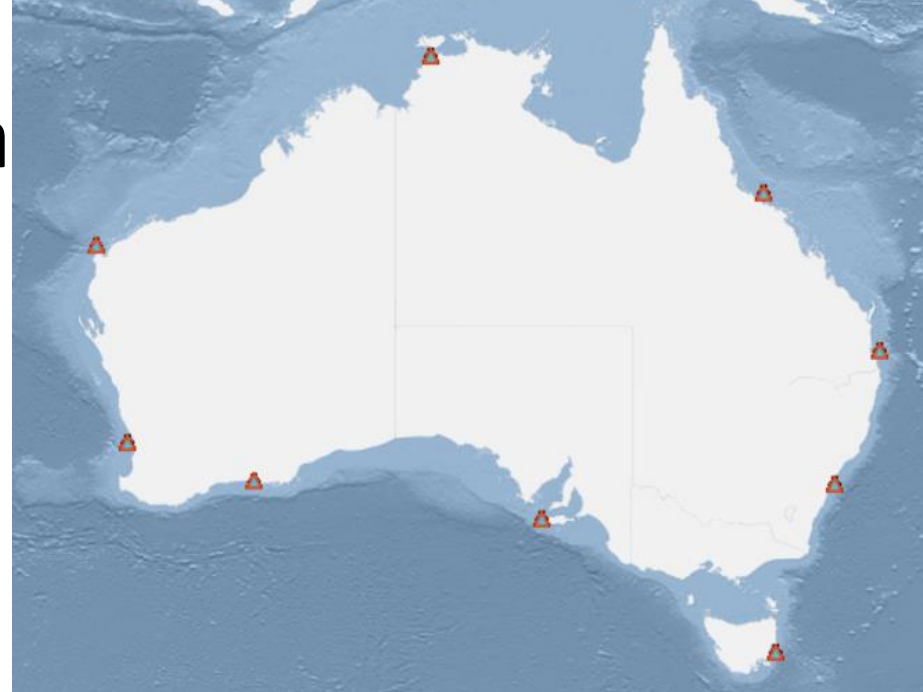


4. Recent expansions



EyeonWater Australia

- Establish network of citizen scientists to make observations are scientifically important.
- Target groups in locations where there is a paucity of in situ observations.
- Use the project to increase scientific knowledge in the citizen scientists communities.
- Adopt and expands the EyeOnWater concept.
- CSIRO will use these observations in monitoring water quality, calibrating satellite images & reporting on the state of the aquatic environment.



Eye on Water Australia water quality & chemistry kit

Parameters measured:

- Secchi depth
- Dissolved oxygen & Biological Oxygen Demand
- Phosphate
- Nitrate
- Ammonia
- Water Colour
- Acidity
- Alkalinity
- Hardness
- CO₂
- Turbidity
- pH
- Temperature

Chlorophyll and Phycocyanin concentration*

When participants borrow Aqualab flurometer

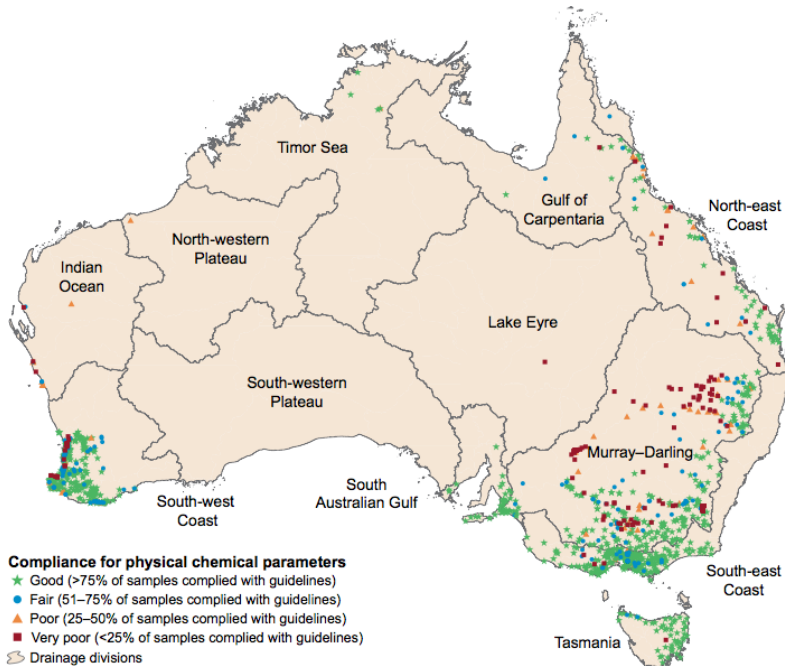




The challenge of *in situ* monitoring

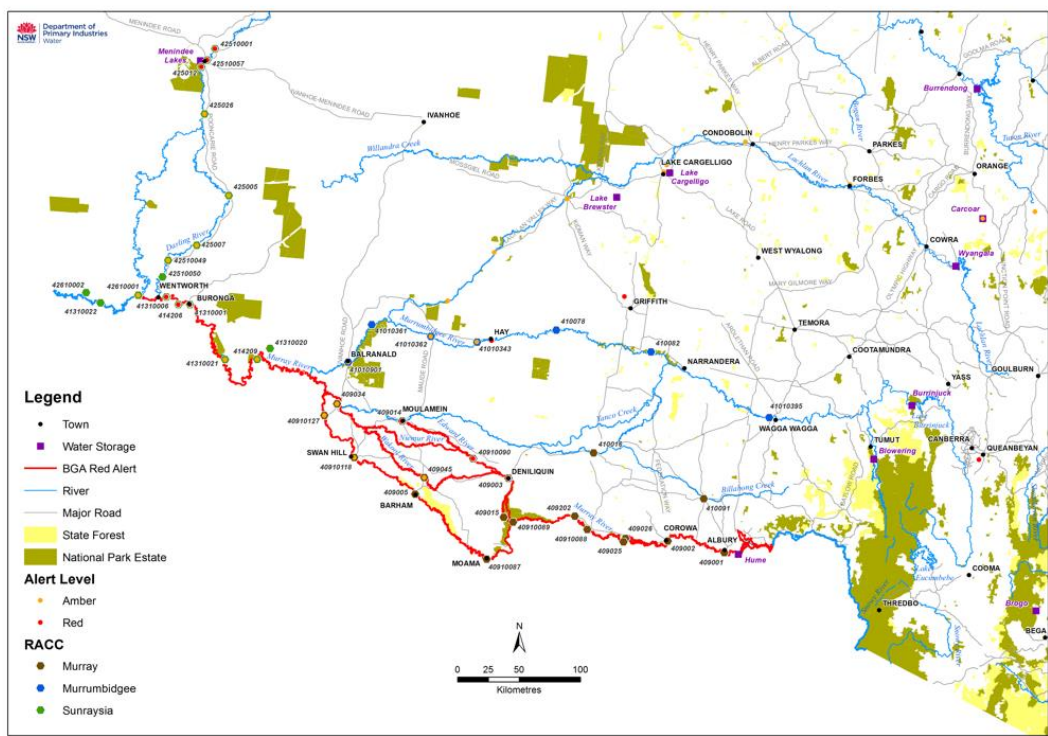
Optical methods could support other monitoring efforts

- Systematic
- Repeatable
- Complements existing *in situ* programs and sensor networks
- Gap filling...





Use case: 2016 Murray River bloom



THE WEEKLY TIMES Create a mentally healthy workplace today [Find out more](#)

NEWS AGRIBUSINESS COUNTRY LIVING SPORT PROPERTY MACHINE

LIVESTOCK SALES CATTLE SHEEP & WOOL DAIRY CROPPING HORTICULTURE WINE WATER

Water

Blue-green algae stretches 1630km along Murray River

April 27, 2016 12:00am
CHRIS McLENNAN The Weekly Times

THE Murray River along the length of the Victoria-NSW border is now consumed by blue-green algae after Swan Hill fell to the bloom late last week.

All 1630km of the river from above Lake Hume to past Wentworth, just 33km from the South Australian border, is now subject to red and amber alerts.

Victoria's blue-green algae incident controller Steve Grant said the bloom could soon be the worst recorded.

"Already it is the second-worst and it only has to get to May 10 to be the worst," Mr Grant said.

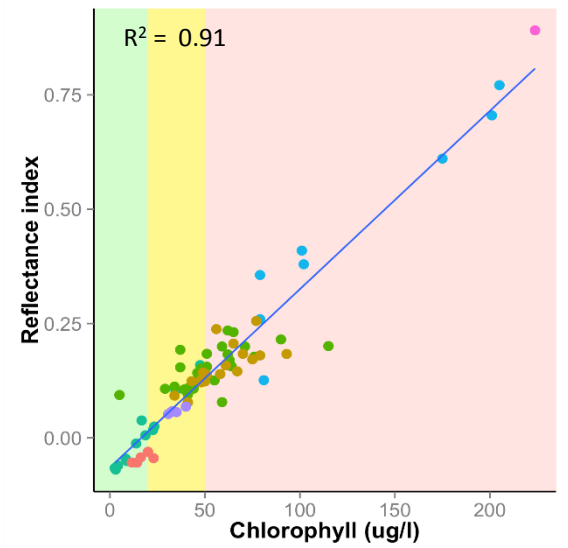
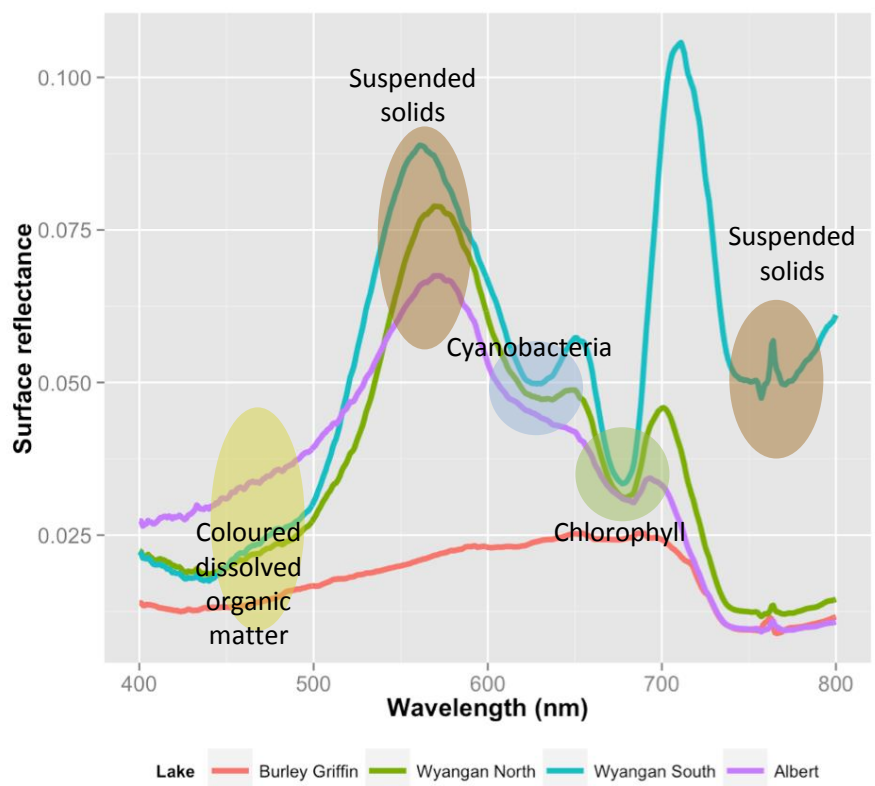
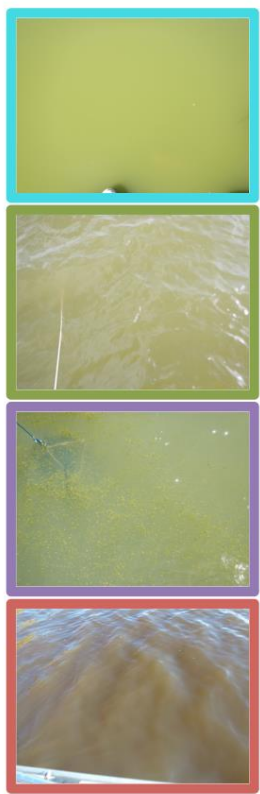
Alanita



Credits: Tim Malthus CSIRO



Driven by colour - information in spectral reflectance



Alert level	Chlorophyll level
Green	<20 ug Chl l ⁻¹
Amber	>20-50 ug Chl l ⁻¹
Red	>50 ug Chl l ⁻¹





Engaging citizen scientists – target group



AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Promoting our profession: enriching science teaching

CSIRO's Teacher Researcher in Partnership program (TRiPP)

- First trial in Canberra then roll out nationally
- Teacher developed curriculum to integrate EoW measurements into a biodiversity and ecology unit for year 9 & 10 students.



Credits: Janet Anstee - CSIRO



Engaging citizen scientists – target groups

KIMBERLEY RANGER NETWORK

HOME > LAND & SEA > KIMBERLEY RANGER NETWORK



- Rangers
- Balanggarra Rangers
- Bardi Jawi Corany Rangers
- Bardi Jawi Rangers
- Dambimangari Rangers
- Goonyandi Rangers
- Karajami Rangers
- Kija Rangers
- Ngurara Rangers
- Nyikina Mangala Rangers
- Nyul Nyul Rangers
- Paruku Rangers
- Ulungu Rangers
- Wunggur Rangers



Credits: Janet Anstee - CSIRO



Results EOW Australia data

Observations - Eyeonwater.org X

www.eyeonwater.org/content/map.php?map_type=color&menu=2¢er=-25.6

EyeOnWater color HOME APPS OBSERVATIONS EDUCATION

Current User - Global - Download - Upload Login - Create User Account

Most active users in selected period last 2 years

- adijkstra-NIOZ (139 photos) 1390 points (level 5)
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Recent measurements

- 06 Nov 2018 04:51:50
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- 05 Nov 2018 16:47:47
- 05 Nov 2018 14:08:08
- 04 Nov 2018 16:06:39
- 04 Nov 2018 15:49:32
- 01 Nov 2018 21:08:42
- 01 Nov 2018 21:06:19
- 01 Nov 2018 19:55:24
- 01 Nov 2018 06:18:12

Photos 95 **Malthus** 980 points
Dorky Dolphin level(4)

Observations - Eyeonwater.org X

www.eyeonwater.org/content/map.php?map_type=color&menu=2¢er=-37.6

EyeOnWater color HOME APPS OBSERVATIONS EDUCATION

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Photos 95 **Malthus** 980 points
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EyeOnWater Australia

How healthy is our water? Use this measurement app to contribute measurements, and join the EyeOnWater community.

Subscribe to the community newsletter

Want to be in the know? We will occasionally send updates on Australia's water quality, and citizen science events. No spam, we promise!

Sign up

Simple to use

Keep the EyeOnWater app handy, and you can contribute to the Colour data with snap of a photo.

Learn how

Expert friendly

On a mission? The EyeOnWater app lets you record additional metrics like sechi disk depth, pH, and more.

I'm an expert

Contributed by you

Interested in becoming a map contributor? Your data helps scientists classify lakes, river, and oceans.

See the map

Get the EyeOnWater app

Available for Android & iOS on the Google Play store and App Store for free.



Waterplantmelder

- Capture “phenomena” waterplant nuisance by sailors
- Logical citizen science option
 - Targets a clear audience (sailors)
 - Citizen has a problem (waterplant nuisance, feeling they are neglected by government)
 - Communication need (government to sailors and v.v.)
 - Government, developers, domain experts and public involved
- Result
 - Many observations during summer
 - Next step: Government to adjust their mowing and inform the public



Source: NH Nieuws



Waterplantmelder (Waterplant warning)



[HOME](#)

[OVERLAST](#)

[OVERZICHT MELDINGEN](#)

[MELDING MAKEN](#)

[ONTWIKKELINGEN](#)



Waterplant gezien?

Waterplanten kunnen voor overlast zorgen voor waterrecreanten en watersporters. Met uw hulp kunnen we in kaart brengen op welke plaatsen in het IJsselmeergebied* (IJsselmeer, Markermeer, IJmeer, Randmeren) waterplanten voor overlast zorgen. Heeft u overlast van waterplanten in het IJsselmeergebied? Laat ons dan weten waar dat is!

*De Waterplantmelder is in eerste instantie voor het registreren van meldingen in het IJsselmeergebied. Mogelijk dat deze later wordt uitgebreid voor andere gebieden.

[MELDING MAKEN](#)

Overzicht meldingen

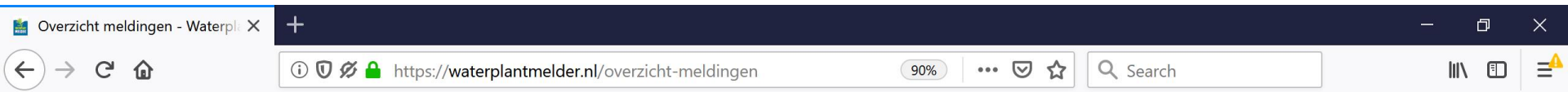
Alle meldingen van gebruikers en beheerders worden direct getoond op een kaart.

Download de app

De waterplanten app is beschikbaar in de Apple App Store en de Google Play Store. Klik op een van de buttons hieronder om direct



Waterplantmelder observations

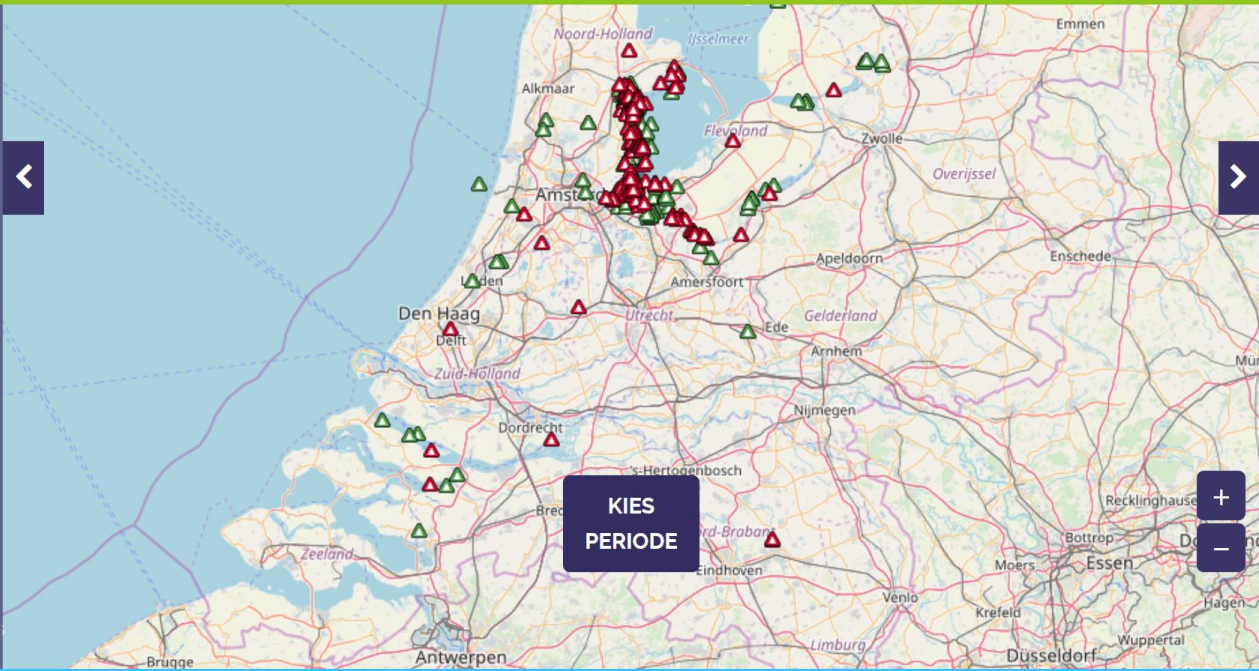


HOME OVERLAST **OVERZICHT MELDINGEN** MELDING MAKEN ONTWIKKELINGEN

LOG IN MAAK ACCOUNT AAN

Legenda

- Alle meldingen
- Actieve meldingen
- Afgehandelde meldingen
- Boeien weergeven
- Maaizones weergeven



Laatste meldingen

- ▲ 24 september 2018
- ▲ 13 september 2018
- ▲ 9 september 2018
- ▲ 7 september 2018
- ▲ 4 september 2018
- ▲ 3 september 2018
- ▲ 2 september 2018
- ▲ 2 september 2018
- ▲ 2 september 2018
- ▲ 2 september 2018

DOWNLOAD DE APP



Waterplantmelder observations

Overzicht meldingen - Waterpl X

https://waterplantmelder.nl/overzicht-meldingen

HOME OVERLAST **OVERZICHT MELDINGEN** MELDING MAKEN ONTWIKKELINGEN

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- 2 september 2018

KIES PERIODE

DOWNLOAD DE APP

Waterplantmelder observations

Overzicht meldingen - Waterpl X


https://waterplantmelder.nl/overzicht-meldingen

MELDING MAKEN ONTWIKKELINGEN

LOG IN MAAK ACCOUNT AAN

Melding

Datum melding	4 augustus 2018
Latitude	52.3769761
Longitude	5.08188473
Oppervlakte (m2)	200 (Vast)
Type	Fonteinkruid



Afbeelding geen waterplant of melding onjuist? Klik hier!

Legenda

- Alle meldingen
- Actieve meldingen
- Afgehandelde meldingen
- Boeien weergeven
- Maaizones weergeven

Laatste meldingen

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- 4 september 2018
- 3 september 2018
- 2 september 2018
- 2 september 2018
- 2 september 2018
- 2 september 2018

Almere Pampus

© OpenStreetMap contributors

DOWNLOAD DE APP



5. Take home message for marine citizen science

- Marine research should **explore uptake** and use
- Target well the right audience. Best result via existing communities: Rangers, schools, nature conservation volunteers. (just shooting with a canon does not work)
- **Build a community!**
- **Create an incentive.** Make sure you have something to offer in return.
- Perform research on the best use of citizen data, on top of existing.
- **Do not forget the business side: Who will pay for the services after project end.**
- We will keep looking for concept upgrades, expansions and uptake of data.

Time for questions



Contact us for collaboration,
and follow us via:

www.eyeonwater.org



EyeOnWater



The EyeOnWater website and adjacent free Apps help you to assess the Colour and Clarity of natural waters



EyeOnWater - A visualisation of scientific data shared by the community

People have always been interested in observing their surroundings. Whereas observation satellites and in-situ measuring stations are set up to monitor vast areas of ocean coastlines, this can now be complemented by EOW Colour, Clarity and Sea Lettuce (Ulva) observations carried out by citizens. Data will be used by scientists (oceanographers, limnologists) and water authorities for statistical and long-term analysis in conjunction with climate research.

Join the community, download the apps:



Colour

The EyeOnWater colour app helps us to classify rivers, lakes, coastal waters, seas and oceans on its colour (it can be used over both fresh and saline natural waters). The observations via the app are an extension of a long term (over 100 years) set of water colour observations made by scientists in the past. You can view them all together in this map application. If you have contributed yourself, do not forget to login for a more personal experience.

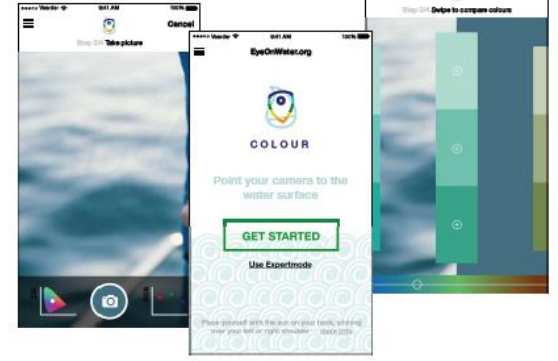


Clarity

Clarity observations are usually done by Secchi Disk, lowering a white disk in the water and measuring to what depth it is still visible. EyeOnWater has collected a large dataset of observations from the past, and this set has been extended by citizens and volunteer measurements contributed via the EyeOnWater app.



Our app



Developed by:



www.eyeonwater.org

A visualisation of scientific data collected and shared by the community