*Mighty Earth, 2017*

# AWA

## *ANALYTICS FOR WATER ACTION*

*A SCIENCE DRIVEN COMMUNITY RESPONSE TO THE WATERWAY NITRATE POLLUTION CRISIS*

Luca Barcelo

Presence of zones with high nitrate
- none
- few
- many
- No information available



Nitrate Levels by Watershed
- Tyson Feed Facilities
- Tyson Meat Processing Facilities
- ADM Grain Processing Facilities
- ADM Grain Elevators
- ADM Feed Facilities
- Bunge Grain Elevators
- Cargill Feed Facilities
- Cargill Grain Silos
- Cargill Meat Processing Facilities
- Major River
- Minor Rivers
- States

Nitrate Levels by Watershed 2016
- 0-1.6 mg/l
- 1.6-4.4 mg/l
- 4.4-8.6 mg/l
- 8.6-17.8 mg/l
- 17.8-32 mg/l

MAP OF NITRATE LEVELS BY WATERSHEDS, 2016 OVERLAID WITH TYSON AND TOP FEED SUPPLIER FACILITIES

Nitrate contamination is primarily caused by pollution from feed crops.

# EUTROPHICATION CRISIS: HOW NITRATE POLLUTION IS KILLING OUR WATERWAYS AND US

Eutrophication ranks as one of the most pressing environmental problems for waterways worldwide (UNEP).

World nitrate contamination not complete nor conclusive.

Nitrates are a direct cause of eutrophication in waterways, creating long-term problems for multiple facets of global economies and human health.

Recent studies undergone by Mighty Earth (right) link meat-production industrial practices to heavily increased nitrate contamination and regions in the American mid-west.
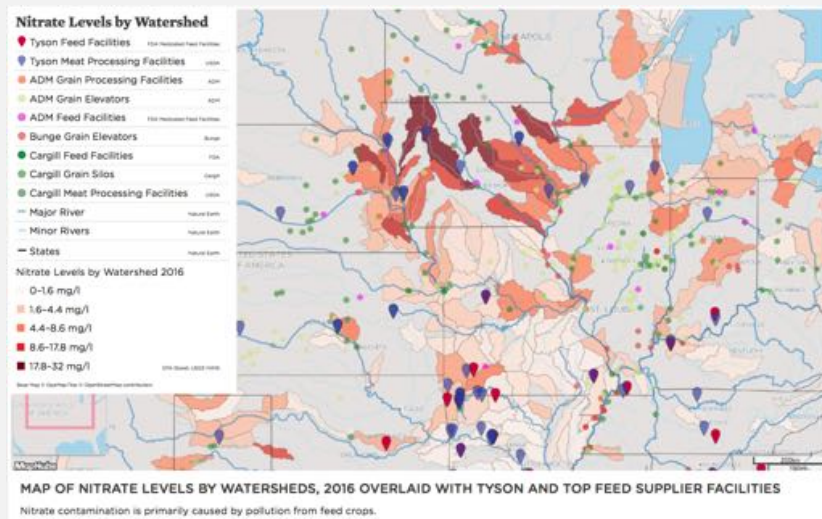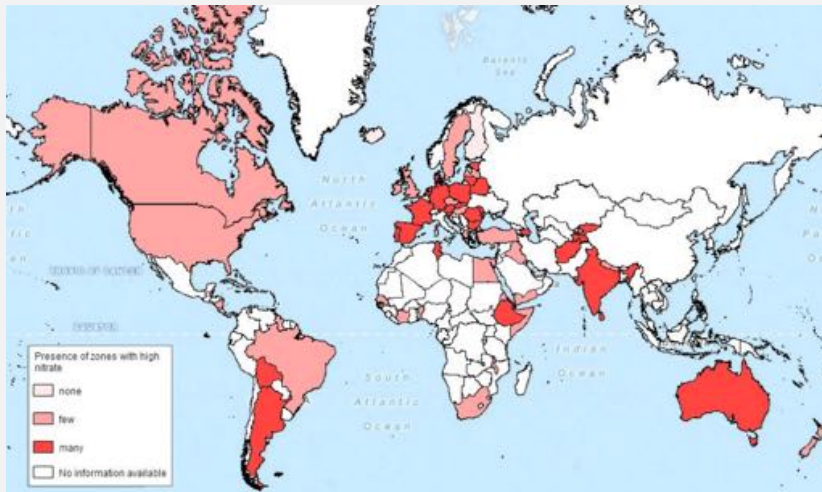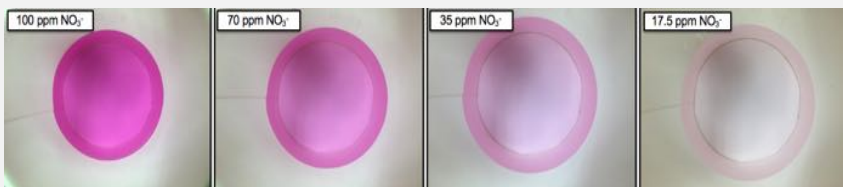
| MIAS Red Color Value | Detected Nitrate Conc (ppm) | Actual Nitrate Conc (ppm) | % Error |
|---|---|---|---|
| 204 | 101 | 100 | 1.1% |
| 183 | 68 | 70 | -3.5% |
| 163 | 36 | 35 | 1.7% |
| 152 | 18 | 17.5 | 3.1% |
| 142 | 2.1 | 2.0 | 3.8% |
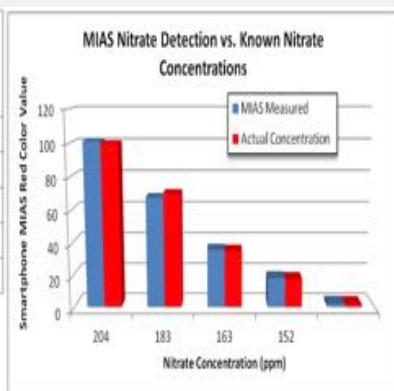


# SCIENTIFIC METHODOLOGY FOR COLORIMETRIC SPECTROSCOPY & DATA ANALYTICS

Through the use of colorimetric spectroscopy, data acquisition and analytics can be undergone out in the field, right at the source, rather than taking samples back into the lab.

For colorimetric detection, nitrates are measured using the Griess test.

From this test, two levels of nitrate may be measured with a percent error of roughly 3% on the low end (from 0.2 – 10 mg/L) to 1% in the medium range (from 2 – 100 mg/L), when combined with the image analysis process included in AWA's detection method (right).
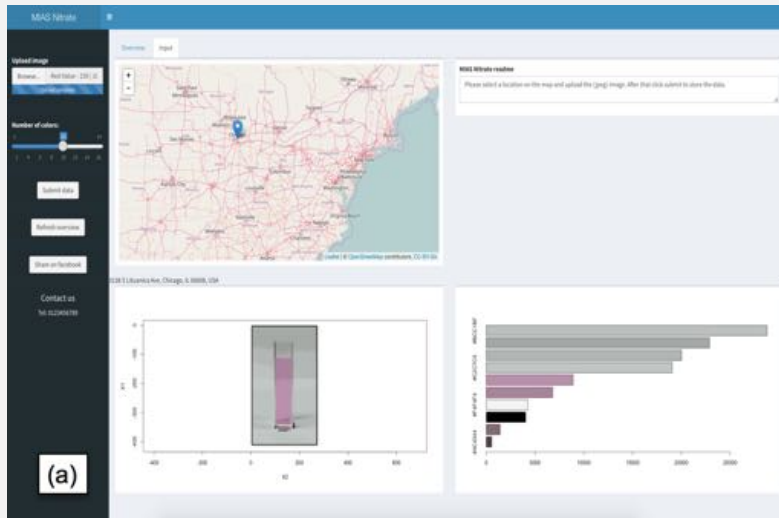
# CROWD SOURCING DATA COLLECTION VIA SMARTPHONES

AWA is built on user interaction with global environments.

Given the ease of access and widespread use of smartphones in the world, a crowd sourcing method that involves the smartphone platform can access a huge percentage of the global population.

Currently, AWA is built on an R Shiny platform, a platform that limits wide spread use.

In order to establish a viable and efficient method for mass user consumption, an iOS and Android app are to be built with the specific parameters.

Similar to Mighty Earth, mapping tech will be utilized.

The use of smartphones in order to facilitate crowd sourcing is integral to the AWA initiative.
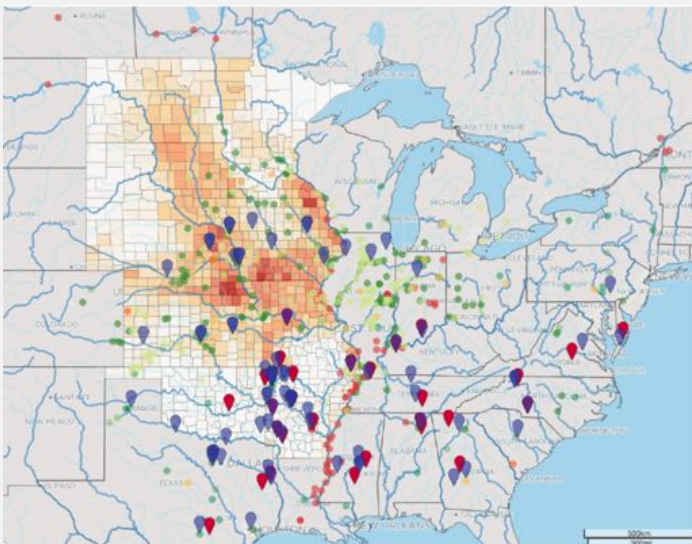
# MARKETING STRATEGY AS USER ADOPTION DRIVES DATA SAMPLE SET SIZE AND GROWTH

- Linguistic application capacity for many widespread languages must be included in order to attract a wider range of users. The application includes eleven languages: English, Spanish, Mandarin Chinese, Hindi, Swahili, Italian, Arabic, French, Malay, Portuguese, and Hausa.

- In order to pull users for growth, marketing campaigns across facebook, Instagram, twitter, and other social media platforms, will attain more users on the platform.

- Application layout includes leaderboard layouts that rank the leading users by number of collections done. This "gaming" facet improves possibility for further user interaction due to a more tangible reward.

- Marketing targets for App & Method Exposure: Consumer Outdoor Stores (REI), Aquatic Recreation (Yacht & Sailing Clubs, Beaches, and Rivers).
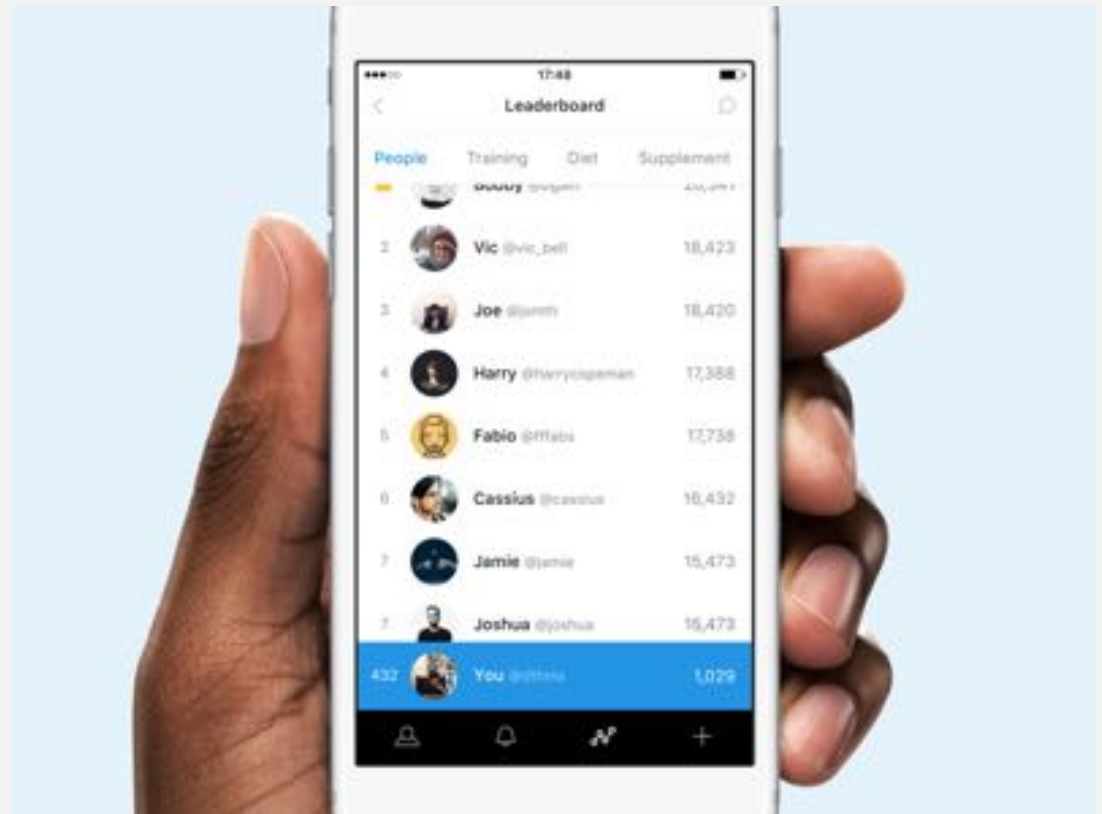
# WEBSITE DEVELOPMENT



- AWA's website will be the central site for all information related to data analyses and database integration.

- Data recorded by individuals on AWA's main iOS and Android applications are transferred to a cloud database that connects to the AWA website. From this data stream, our website can decipher trends and interpolate data from NOAA's own database in order to gain a more accurate representation of nitrogen shifts around the world.

- Furthermore, users have access to full maps that display their intended location's nitrate water quality. This mapping technology is also present on our smartphone application, but offers more features on our website.

- News and alerts are displayed about possibly harmful trends and areas prone to be effected.
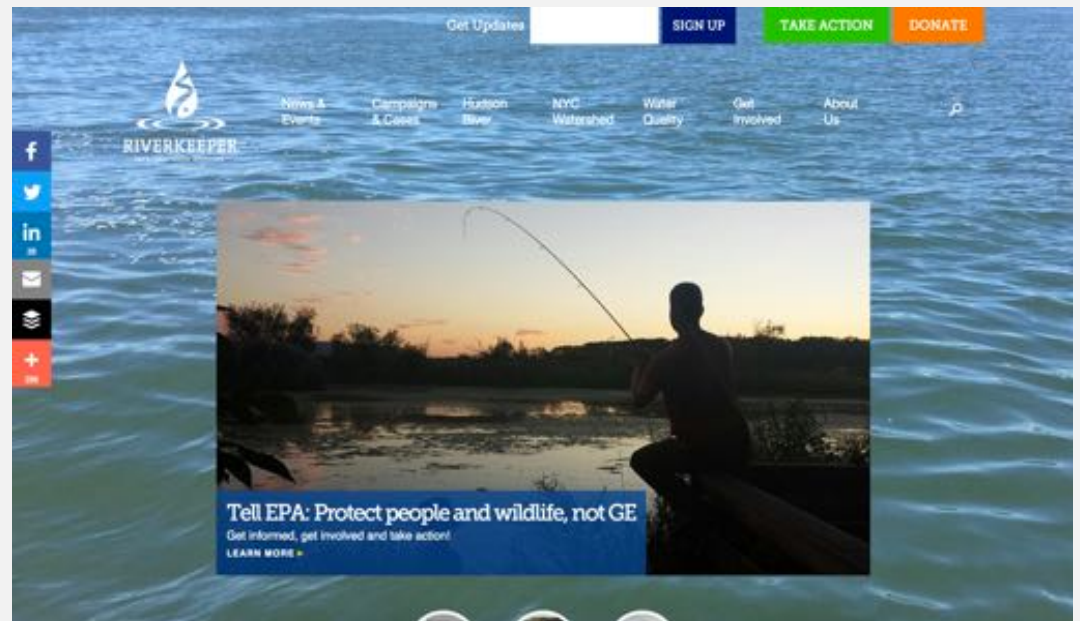
# COLORIMETRIC SCIENCE

- In the Griess test nitrate is reduced to nitrite through the addition of zinc powder to a solution.

- The production of an azo compound, with a red-pink color shade, is achieved by quantitatively converting sulfanilic acid to a diazonium salt through a reaction with nitrate in the acid solution.

- The diazonium salt is then coupled with N-(1-napthyl)ethylenediamine, forming the intended azo compound.

- In order to reduce error produced by environmental factors, the Griess reagent and zinc powder will be included in pre-packaged cups (relatively small biodegradable foldable paper cup), whereby when sampling, the user will place his or her smartphone over the top of the cup, blocking out direct UV light from interfering in the photo.
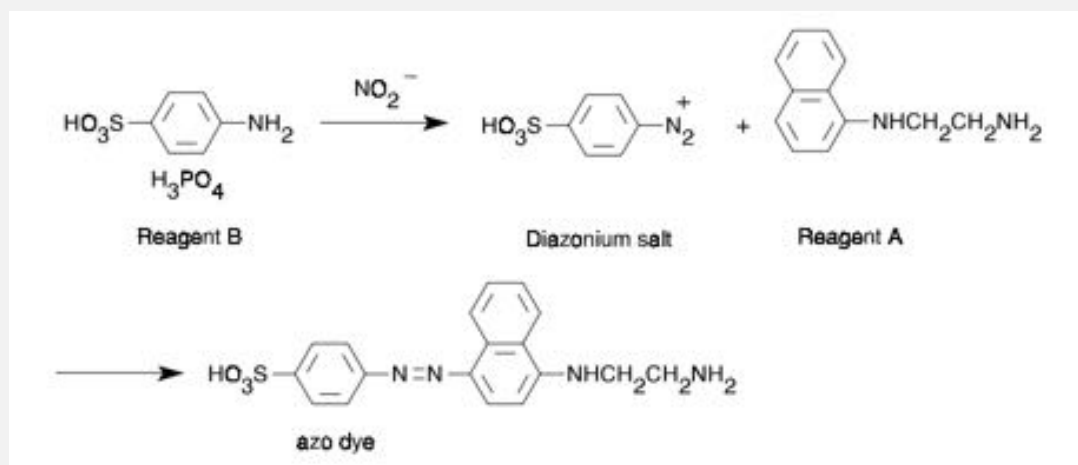
# DATA SCIENCE

- The principle facet of AWA's response to eutrophication through crowd sourcing nitrate data involves this intensive process of analysis.

- AWA's database is compared and data points correlated with data from other commercially available data points (such as storms, floods, rain fall, fertilizer usage, etc.).

- this intensive data stream that will be imported from user interaction with AWA into an adaptable database will be used not only for community education, but also for academia & NGO research initiatives, industrial activism, and more efficient and narrowly targeted governmental regulation.

- At the end of each month, AWA will release a report on the state of our world's waterways, which will serve as a supplement to research institutions, governmental bodies, and industry sourced data.

## PROJECT EXECUTION

- AWA is managed and operated by a group of volunteers that take part in ensuring data integrity, marketing the AWA method, refilling collection paper dispensaries, and other tasks that make AWA what it is.

- The management team consists of three individuals: Luca Barcelo, Founder and CEO, Alessia Barcelo, CMO, Aaron Peterson, CFO. While our volunteer team consists of 10+ individuals with tasks aforementioned and more.

# AWA
# BUDGET

| Item | Cost | Comments |
|------|------|----------|
| **Prototype Design & Testing** | **$ 1,500** | |
| Research (QC, Benchmark, Calibration) | 1,500 | lab tests benchmarking set red values, OSHA, National quality standards |
| **App Development** | **$ 45,000** | |
| Software/app development iOS | 20,000 | Includes UI + Database management and creation |
| Software/app development Android | 10,000 | Includes UI + Database management and creation |
| Creative UI | 15,000 | Scope to integrate with app engineering |
| **Website** | **$ 15,384** | |
| Domain Management (awaterra.com) | 384 | Initial limit of 9 users |
| Website Design & Development | 15,000 | |
| **Data Protection & Housing** | **$ 11,000** | |
| Hosting Server (Website) | 1,500 | |
| Cloud Database (from app to website) | 8,000 | Scope for 100,000 users of live data |
| Hosting User login info | 1,000 | Scope to integrate into Hosting |
| Hosting data security | 500 | Scope to integrate into Hosting |
| **Marketing** | **$ 4,000** | |
| Ad design | 500 | |
| Creative Brand Logo | 500 | |
| Advertising web/print | 3,000 | Long Island Sound Area (Water Recreation) | Facebook Ads |
| **Operating expenses** | **$ 3,220** | |
| Boxes with Collection papers set up at waterways | 1,000 | For Long Island Sound Area |
| Foldable Collection paper | 20 | 2000 sheets. $1000 for 100,000 sheets of biodegradeable paper |
| Greiss Reagent & Zinc Powder | 1,000 | Enough for 1000 data points |
| Point of Sale Displays at Stores | 500 | for 30 locations like REI, Orvis, Yacht Clubs, Beaches |
| Mailing Collection Paper & Reagents to Individuals & Companies | 500 | |
| App Store Placement (iOS) | 200 | App downloaded for free |
| **General management expenses** | **$ 1,550** | |
| 501c non profit setup | 250 | |
| Meeting costs | 250 | |
| Policy Team to Washington D.C. | 1,050 | |
| **Total** | **$ 81,654** | |