# Tanzanian Water Wells

A Machine Learning Model - Jan. 2023

# Water Aid - UK

An NGO based in the United Kingdom that works on access to clean water around the world, especially the African continent.

*Access to clean water, decent toilets and good hygiene are basic human rights.*

Works in partnership to improve access to these three essentials through a combination of programmatic and policy work.

## CHALLENGES

Around 60% of the population in Tanzania and bordering countries have access to improved water. *

Water access, quality and quantity varies.

Drought, landscape change, and climate change are straining existing surface water supplies.

Identifying and Repairing water wells is resource intensive.

*According to the World Sector Report (2019)

# Problems to solve

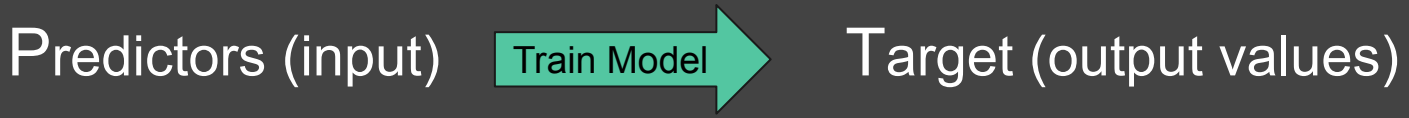
1. **Water Aid** needs a predictive tool to identify non-functioning wells and functioning wells in need of repair.

2. **Water Aid** needs to be resourceful and targeted in their approach. They need a starting location for their work.

3. Many **wells** are old or use outdated pump technologies.

## Why Machine Learning?

Machine learning algorithms use historical data as input to train a model to predict new output values.



## The Data

60,000 Water Well Records

Taarifa Waterpoints Dashboard

Tanzanian Ministry of Water

## Predictors

26 Well Features

9 Water Basins

Water Access/Quality

Pump Tech

Management

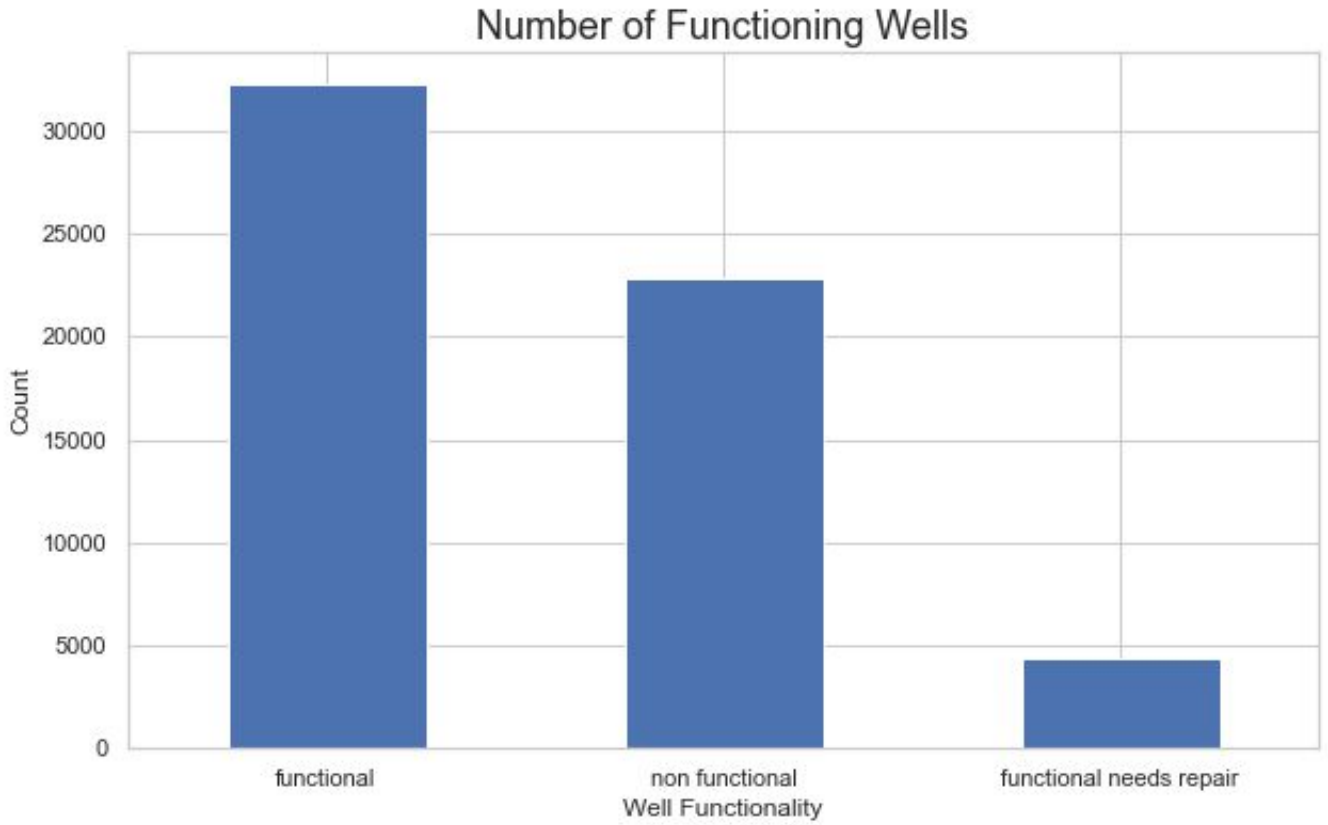
## Target

Functioning Wells

NonFunctioning Wells

Functioning but need repair

Figure 1: The Nine Major River Basins of Tanzania (source: CDM Smith 2018a).


Number of Functioning Wells
Count
30000
25000
20000
15000
10000
5000
0
functional
non functional
functional needs repair
Well Functionality

# Model Results -Precision

Out of all positive predictions, the amount that are actually positive. Of all wells predicted to be non-functional, how many really are nonfunctional?

**Functioning Wells**

82%

**Nonfunctioning Wells**

83%

**Functioning in Need of Repair***

34%

* often are actually functioning, don't need repair

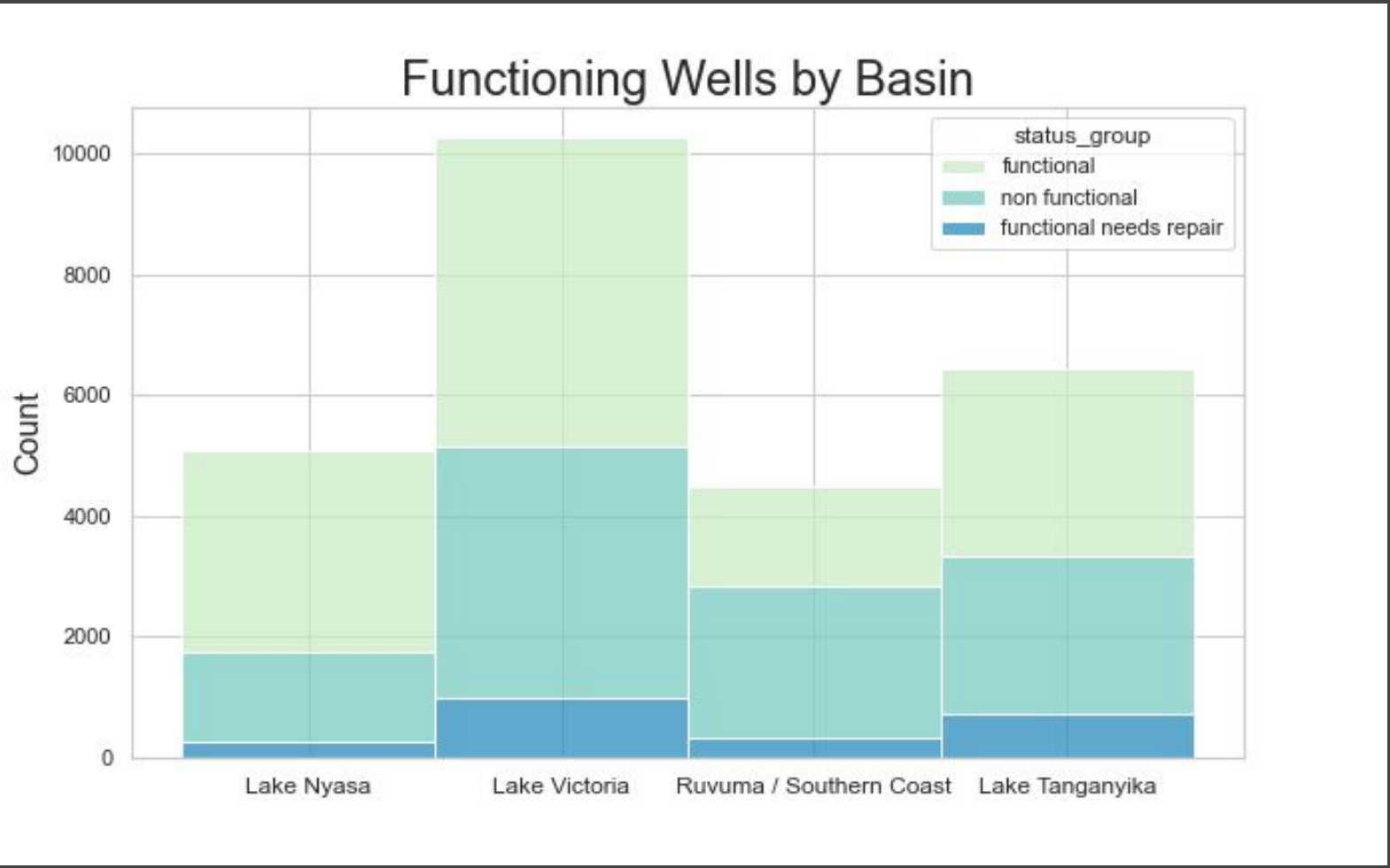
# Model Results -Recall

Of all correctly identified cases, the amount that were predicted positive. Or, of all non-functioning wells that are actually non-functioning, how many were predicted to be non-functioning?

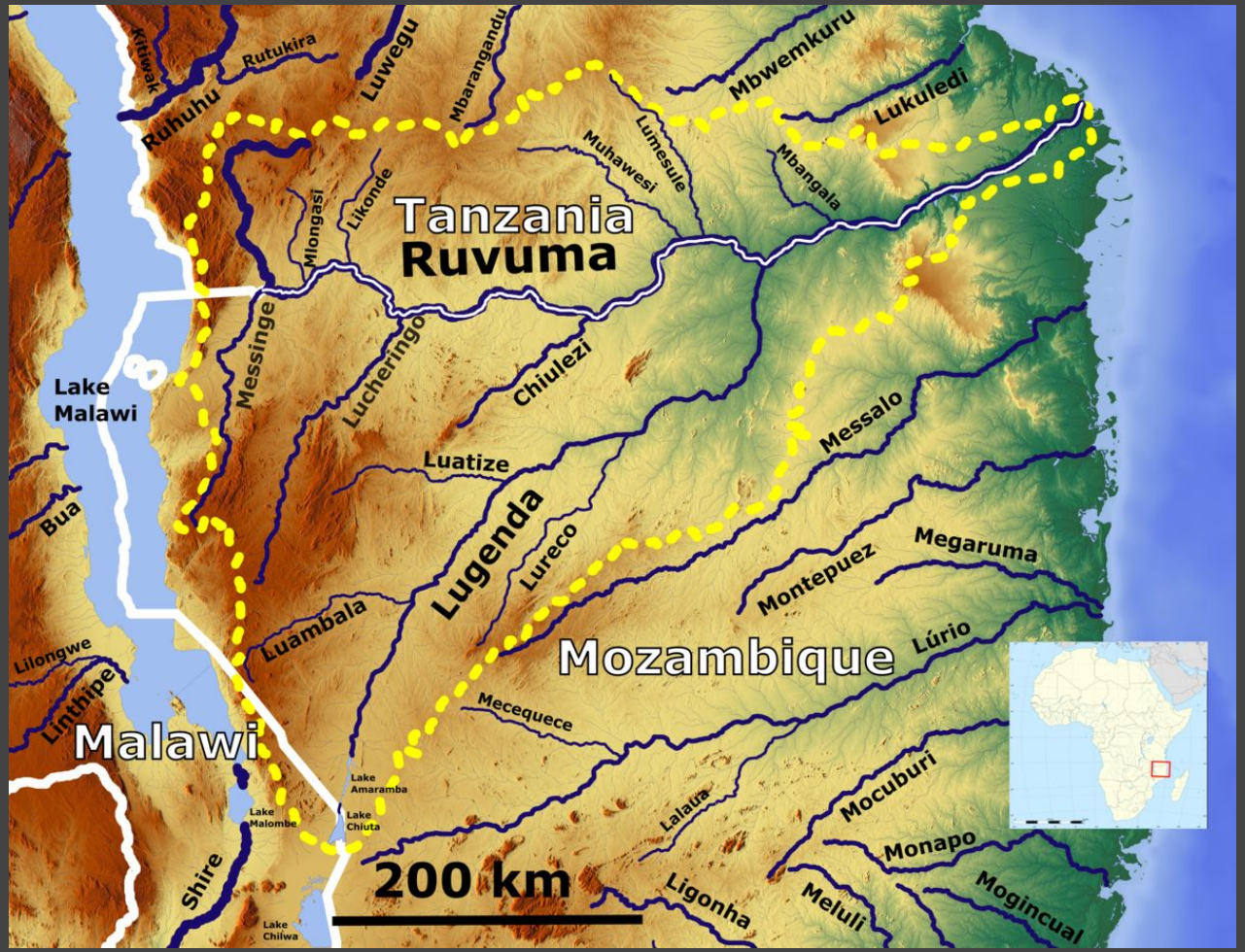
| Functioning Wells | Nonfunctioning Wells | Functioning in Need of Repair |
|---|---|---|
| 79% | 75% | 60% |

## Recommendation

Focus on non-functioning wells rather than functioning wells in need of repair.


Functioning Wells by Basin
status_group
functional
non functional
functional needs repair
Count
10000
8000
6000
4000
2000
0
Lake Nyasa
Lake Victoria
Ruvuma / Southern Coast
Lake Tanganyika

# Ruvuma Water Basin



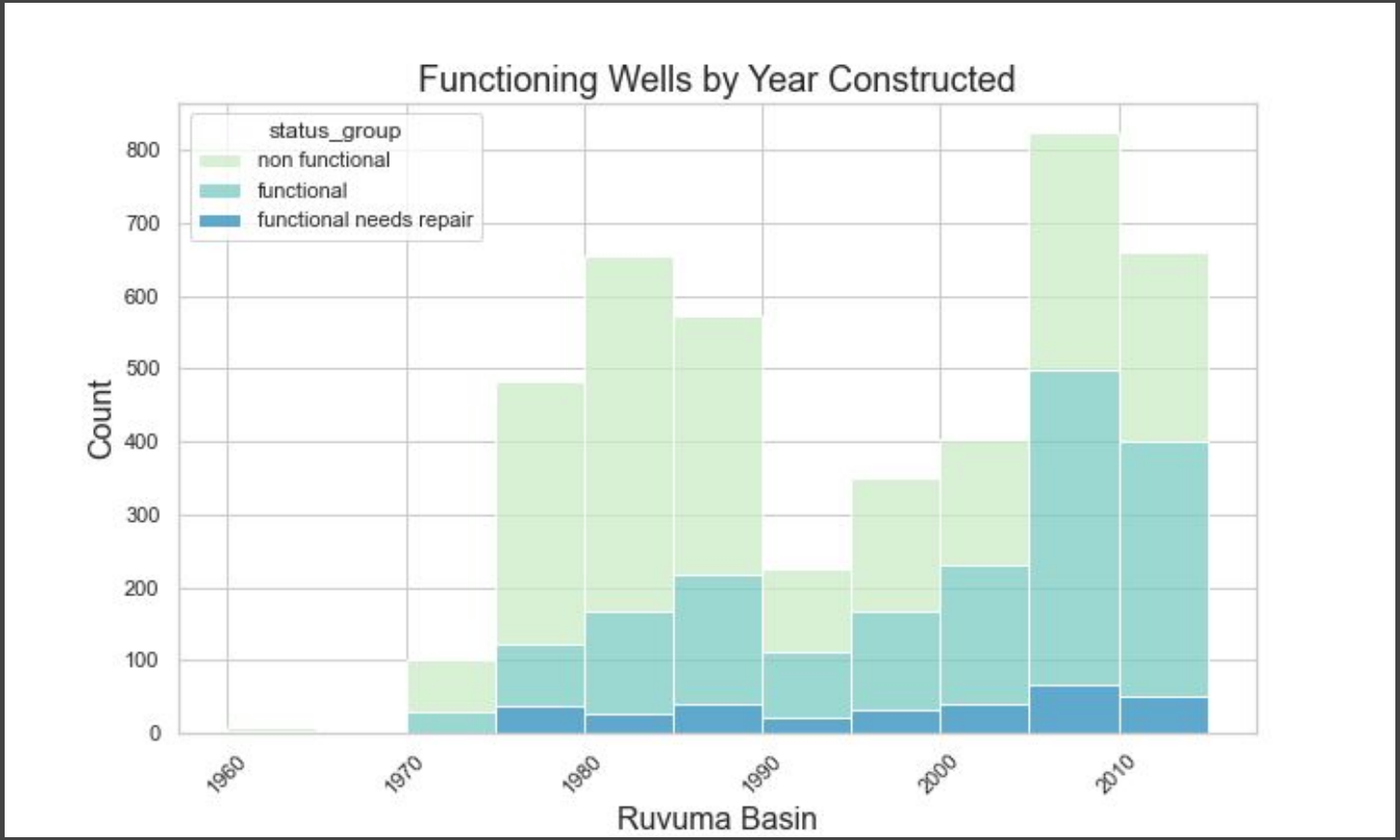
## Recommendation

Over 55% of the wells in the Ruvuma Basin are non-functional.

Greater need and targeted opportunity.

Transboundary work in both Tanzania and Mozambique.

## Ruvuma / Southern Coast Basin



## Recommendation

Target non-functioning wells in the Ruvuma Basin built between 1975-1990.

Nonfunctioning wells account for 70% of all wells built during this period.

# Thank you

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