Managing city scale disasters: From Cape Town's 2015-2018 drought disaster planning

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Abstract: **Disaster planning for city-wide shocks became extremely neccessary specifically as cities face severe climatic problems. The paper provides a distinctive perception to the disaster planning and management which has taken in the Cape Town city as its most acute drought that ever happened in the town's history. It mainly describes how risk was managed and understood by the government, which included the risk prioritizing and mitigation, design of points and location of distribution of water rations for the people. This paper also includes the individuals experiences and communicate with the officials for management planning.**

Keywords: Drought,slow-onset,city-wide, climatic changes, slowonset,impact,disaster, adaptation, prediction, management.

1. INTRODUCTION

The capability of making actionable and accurate decisions and ideas in city issues is a long established challenge which should be handled well. Most of the times the challenge depends on how the town is handling it and how come to prevent it from happening again. As the climate changes the disaster rate increases and the impacts became a threat to the city and the individuals, mainstreaming disaster risk are growing day by day. When there is climatic changes occurs, disaster and risk plans integrated together, but the implementation of these is limited. The study explains the existing system lacks a lot of challenges and should focus on mainstreaming disaster risk and climatic change in urban regions.Planning is inadequate when it used with a city-wide extreme event, and how can it be improved using planning and governance.

Responding to disaster alone is challenging but in cities there are often institutional challenges occurred when responding to extreme kind of climatic changes. The slow onset disasters like drought are difficult to navigate successfully because of unreliability of timings and impact, complex governing challenges, limited capacity make these disasters lead to risk and lack of stability and even collapse in all areas like social, political or financial aspects of urban regions.
Preparedness for disaster and responses needs the allocation of resources under highly stressed conditions and are mostly characterized hesitation in making decison from decision-makers and the public lack of knowledge about the severity of the risk the city might face.

Preparedness of drought mainly involves two aspects first one is monitoring and early warning. And the other one is prediction, resilience, vulnerability and assessing impacts, mitigation and response planning and measures.

The data explains how the drought occurred and after that the measures which are taken to solve the problem and then the prevention measures. It provides a casestudy of city slow-onset disaster management which can also considered in other urban centers around the world if any similar situation occur. It also gives a explained information about key elements of the Disaster Planning, i) the Day Zero decision-making trigger point, ii) identifying risk and mitigating it, iii) planning for the design and location of points of distribution (PODs), which became a cause the development of a Social Vulnerability Index and an Economic Node Index. It explains i) skills needed to solve city-wide disaster planning and mitigation, ii)disaster responses iii)requirements for transition from conceptual planning to operational planning in the time of disaster, iv) To use outsourced capacity effectively without making any more issues v)To efficiently apply previously used disaster management techniques which was useful and a success at that times.

2. OVERVIEW OF THE CAPE TOWN DROUGHT

Cape Town experience a mediterranean climate with a dry summer and wet cool winters yearly, with 70% of its rain falls in the time of May to October. Rainfall in Cape Town varies from 400 mm per year on the west coast and to 2000 mm per year in the mountains. The water the city mainly uses is from the Cape water supply system(WCWSS) it have large rain fed dams from a small catchment and other town areas. The WCWSS is managed by the national Department of Water and Sanitation in cooperation with the City, and has a merged dam storage volume of about 900,000 ML of water, it help to more for the personal use and the scarcity was not even a possibility because they had more than enough water. National Department had taken care of all the Water and Sanitations.But 68% of the water consumed in Cape Town is used by residential people, with 5.1% used in informal settlements, while retail and offices use 14% and industry usage is 4%. The city had a strong water plannings and establishments and they never ever thought one day they will face water scarcity and it will became the most important issue wish clearly made their lives much more complicated.

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Household uses varied according to the usage, they had also depended piped water access for their household needs; around 80% of houses have their own tap water in the home while the remaining had piped water sources.

3. DEVELOPMENT OF DISASATER PLAN

3.1 Disaster plan

The Disaster Risk Management (DRM) department had set of plans which developed in the beginning of rapid onset disasyers.

For each phases, they have closely monitored how the water users affected due to the scarcity of water and how they are handling the mitigation process. The second phase has never implemented directly but the process was still there.

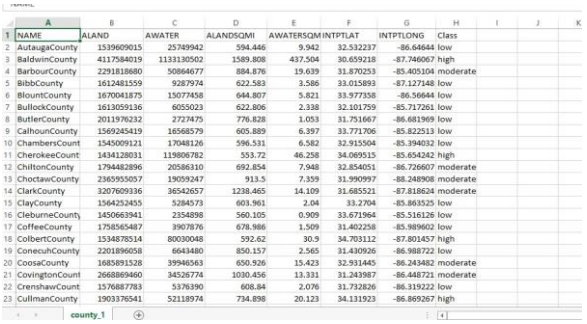
Fig. 3. Cross-functional team set up at the City of Cape Town to respond to

Values to compare and analyze the cancer rate in 20152018 drought plan.

IMPLEMENTATION

Implementation Steps

Figure1 :Download and Install Weka Tool



	NAME	ALAND	AWATER	ALANDSQMI	AWATERSQMI	INTPTLAT	INTPTLONG	Class
2	AutaugaCounty	1539609015	25749942	594.446	9.942	32.532237	-86.64644	low
3	BaldwinCounty	4117584019	1133130502	1589.808	437.504	30.659218	-87.746067	high
4	BarbourCounty	2291818680	50864677	884.876	19.639	31.870253	-85.405104	moderate
5	BibbCounty	1612481559	9287974	622.583	3.586	33.015893	-87.127148	low
6	BlountCounty	1670041875	15077458	644.807	5.821	33.977358	-86.56644	low
7	BullockCounty	1613059136	6055023	622.806	2.338	32.101759	-85.717261	low
8	ButlerCounty	2011976232	2727475	776.828	1.053	31.751667	-86.681969	low
9	CalhounCounty	1569245419	16568579	605.889	6.397	33.771706	-85.822513	low
10	ChambersCount	1545009121	17048126	596.531	6.582	32.915504	-85.394032	low
11	CherokeeCount	1434128031	119806782	553.72	46.258	34.069515	-85.654242	high
12	ChiltonCounty	1794482896	20586310	692.854	7.948	32.854051	-86.726607	moderate
13	ChoctawCounty	2365955057	19059247	913.5	7.359	31.990997	-88.248908	moderate
14	ClarkCounty	3207609336	36542657	1238.465	14.109	31.685521	-87.818624	moderate
15	ClayCounty	1564252455	5284573	603.961	2.04	33.2704	-85.863525	low
16	CleburneCounty	1450663941	2354898	560.105	0.909	33.671964	-85.516126	low
17	CoffeeCounty	1758565487	3907876	678.986	1.509	31.402258	-85.989602	low
18	ColbertCounty	1534878514	80030048	592.62	30.9	34.703112	-87.801457	high
19	ConecuhCounty	2201896058	6643480	850.157	2.565	31.430926	-86.988722	low
20	CoosaCounty	1685891528	39946563	650.926	15.423	32.931445	-86.243482	moderate
21	CovingtonCount	2668869460	34526774	1030.456	13.331	31.243987	-86.448721	moderate
22	CrenshawCount	1576887783	5376390	608.84	2.076	31.732826	-86.319222	low
23	CullmanCounty	1903376541	52118974	734.898	20.123	34.131923	-86.869267	high

Prepare Dataset of drought in excel and convert to csv file.

STEPS INCLUDED IN DATA ANALYZING

Weka (Waikato Environment for Knowledge Analysis) is a group of machine learning algorithms for mining of data.Main steps included in analyzing data includes:

- Dataset Preparation
- Dataset Preprocessing
- Dataset Classification

In Dataset preparation we create an excel sheet with the following attributes: Number of Dataset, Rank of Each Type of drought, Death Number ,Death Rank and thee corresponding class for each year 2016 and 2018. The next step is to create the corresponding CSV file of the Dataset.We will convert the corresponding file into arff file(Attribute Relation File Format) ,a header is used which provides metadata about the data types in it's columns. The arff file will be processed in the Weka tool for data processing and classification.The classified data will use the Precision and Recall

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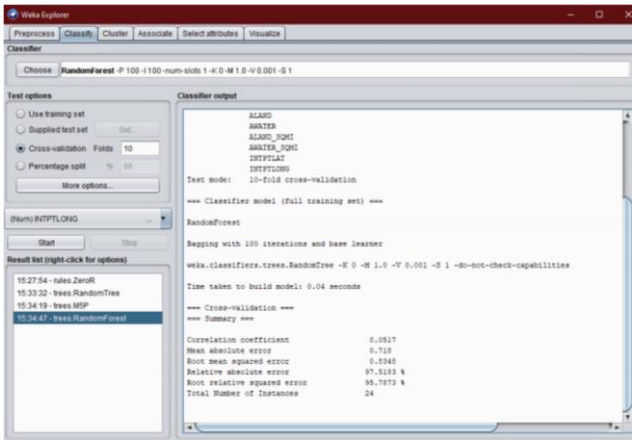
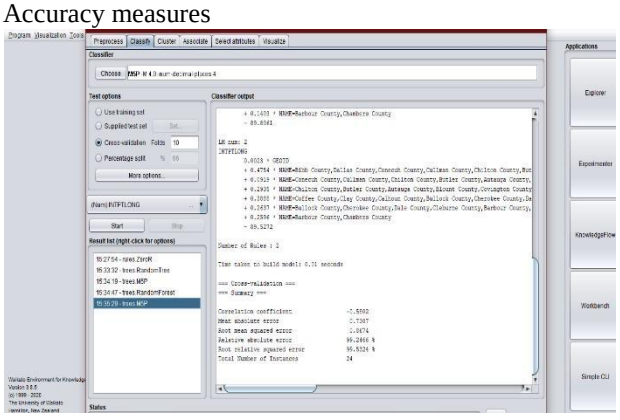
Standardized index	D-scale	Description
-0.50 to -0.79	D0	Abnormally dry
-0.80 to -1.29	D1	Moderate drought
-1.30 to -1.59	D2	Severe drought
-1.60 to -1.99	D3	Extreme drought
-2.0 or less	D4	Exceptional drought



Apply Random forest to the corresponding given dataset of drought from
2016-2018

Accuracy measures



ANALYSIS

Correlation Coefficient	-0.5802
Mean absolute error	0.7307
Root Mean squared error	0.8674
Relative absolute error	99.2466
Root relative squared error	99.5324

Here , Weka Tool is used for analysing the drought rate among the people in the year 2016 and 2018. By using Random Forest in estimating the drought rate enabled us to determine the current situation of drought graph.

Summary for Drought Rate

Total no. of instances	24

CONCLUSION

The Result of analyzing drought rate in the years 2016-2018 shown that there is a slight variation in the drought rate which may be due to the increased facilities and measures taken to prevent drought. But it is evident that there is always an increase in number of drought day by day. The analysis have been carried out with the help of Random Forest Classification which showed the result as :

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Root Mean squared error	0.8674
Relative absolute error	99.2466
Root relative squared error	99.5324
Total no. of instances	24

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