

Managing Drought Mitigation and NRW Reduction Measures

Mark Shepherd PrEng
CEO, JOAT Consulting (Pty) Ltd
an EOH Company



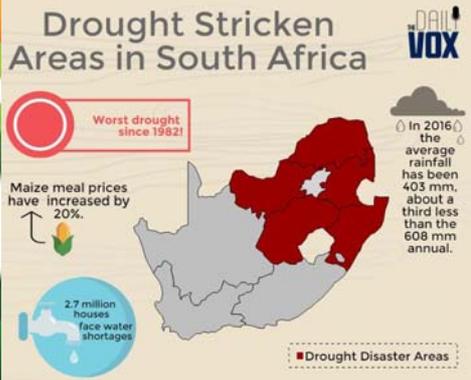

Managing Drought Mitigation Measures

1. How bad is our drought?
2. How to be prepared for a drought
3. High level operational response to drought conditions
4. Balancing competing objectives
5. Managing the impact of drought response
6. Performance management, monitoring and evaluation



How Bad is Our Drought?

Drought Stricken Areas in South Africa



Worst drought since 1982!

Maize meal prices have increased by 20%.

2.7 million houses face water shortages

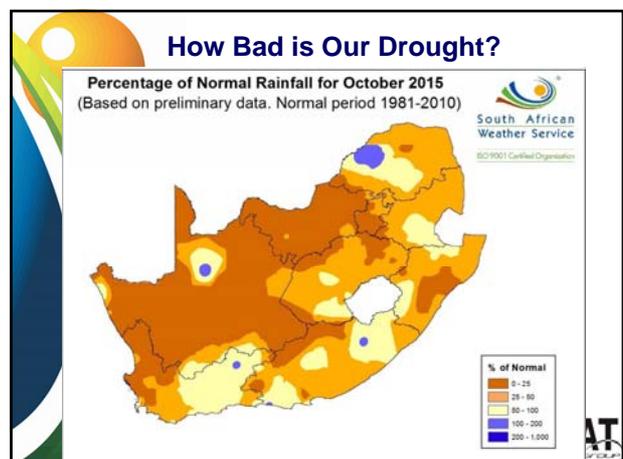
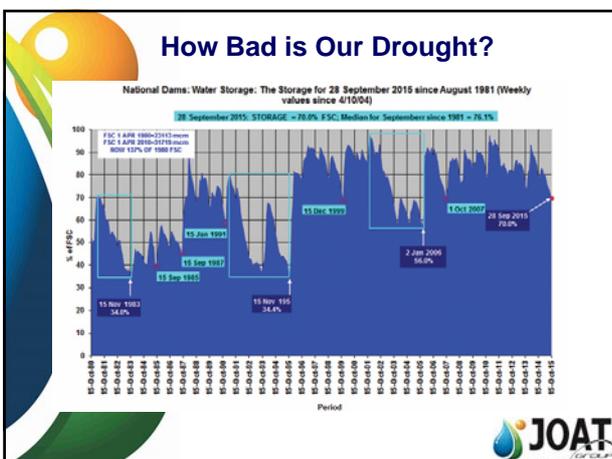
In 2016, the average rainfall has been 405 mm, about a third less than the 608 mm annual.

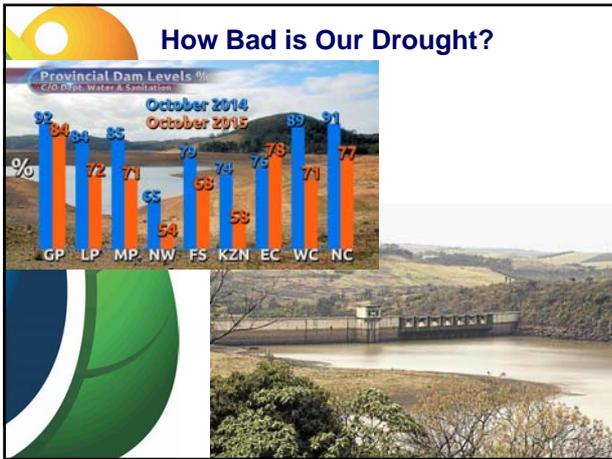
Drought Disaster Areas



How Bad is Our Drought?

- South Africa's dams were on average 55.4% full on 11 January 2016, although it is still some way off from the 35-year low point of 34% reached in November 1983.
- The current drought is "one of the biggest drought events in living memory". However, the extent of the severity of the drought is difficult to measure because it is not over yet. Eight of our nine provinces have been declared drought disaster areas



Is Our Drought Affecting Us?

Drought takes its toll

Subsistence farmer in Mzimweni claims to have lost 15 cattle in less than two months

Feature

Floods, droughts to be the norm

Kareiva Piller reports back from the annual meeting on climate change by India's Centre for Science and Environment in New Delhi last week.

The Citizen
Drought tightens its grip on country

STILLING HAZE

JOAT

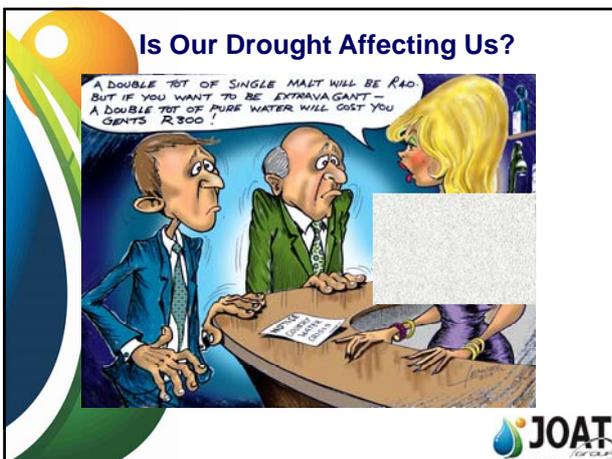


Is Our Drought Affecting Us?

Daily News
Taps turn off tonight
Water restrictions hit central, south Durban

The Star
WATER SHEDDING!
Residents on brink of facing severe cuts
Pray for rain, public urged

SABC NEWS



Types of Drought Impacts

There are a number of different impacts of a drought, all of which must be considered in planning for and responding to drought conditions. Drought impacts can be either "direct" or "indirect" and are typically classified as follows:

- Economic
- Enviromental
- Social
- Technical

JOAT

Technical Impacts of Drought

Technical impacts of drought are ways that water infrastructure is affected :

- Intermittent water supply – positive and negative pressures, increased bursts
- Inefficient system operation
- Damage to pumps, motors and control valves
- Damage to consumer meters
- Increased vandalism and abuse



How to be Prepared for a Drought

- We need to understand and accept that, in South Africa, droughts will happen (and the subsequent floods!)
- All Water Services Authorities (and Water Services Providers) need to be prepared for responding to drought conditions
- There are a number of standing response requirements that need to be in place as part of any good practice:
 - Operations and Maintenance Plans
 - Asset Management Plans
 - Emergency Response Plans
 - Drought Response Plans

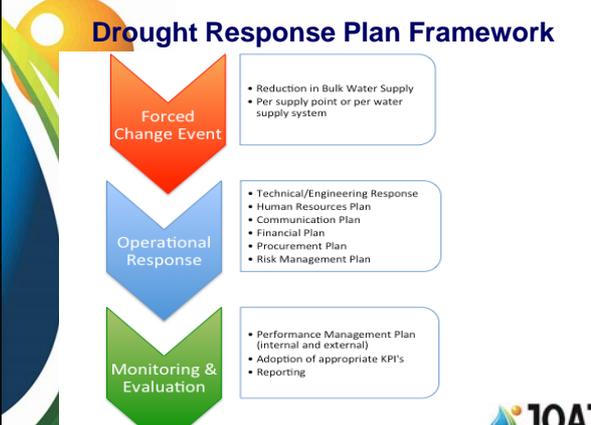


Drought Response Plans

- A Drought Response Plan needs to document, in advance, a WSA's planned response to reduction in bulk water supply
- It needs to address all operational aspects of the WSA's business
- It also needs to address interaction with the consumers
- DRP's should be integrated into a Disaster Management Framework that is required in terms of Section 42 of the Disaster Management Act (Act 57 of 2002)



Drought Response Plan Framework



- Forced Change Event**
 - Reduction in Bulk Water Supply
 - Per supply point or per water supply system
- Operational Response**
 - Technical/Engineering Response
 - Human Resources Plan
 - Communication Plan
 - Financial Plan
 - Procurement Plan
 - Risk Management Plan
- Monitoring & Evaluation**
 - Performance Management Plan (internal and external)
 - Adoption of appropriate KPI's
 - Reporting



Technical Response Plans

The Technical/Operational Response Plan should include the following:

- Detail operational response to a reduction in bulk water supply, in 5% increments from a 15% reduction to a 50% reduction in bulk water supply
- Confirmation of any operational/design constraints that may need to be adhered to
- Identification of all intervention that can be implemented for demand reduction (real loss reduction and water conservation measures), on a reservoir supply zone basis



Technical Response Plans

The Technical/Operational Response Plan should include the following:

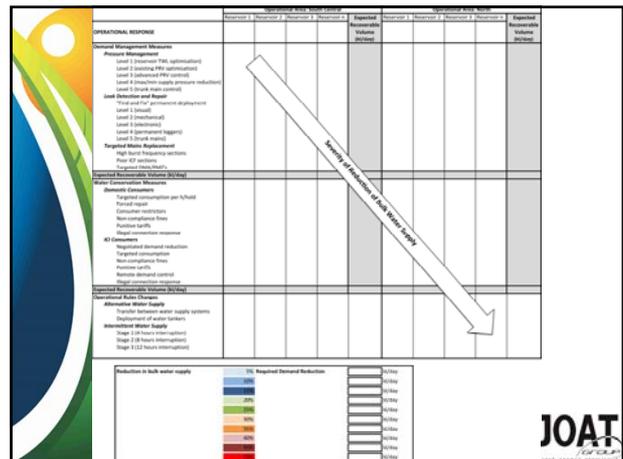
- Quantification of theoretical impact of various real loss reduction and water conservation/consumption control measures, both on a reservoir supply zone and point of supply basis, per 5% reduction in bulk water supply
- Identification of roles and responsibilities of each WSA Department in response to each 5% reduction in bulk water supply
- Development of a prioritized Response Matrix that clearly identifies the activities to be undertaken in each reservoir supply zone per 5% reduction in bulk water supply



Technical Response Plans

The Technical/Operational Response Plan should include the following:

- Determination of implementation time frames for each work package activity
- Flow chart that summarises all response actions that can be viewed at any operational level

Operational Response Plan table with columns: Operational Response, Expected Response, Expected Response Volume Profile.

Operational Response categories include: Operational Management Measures, Water Conservation Measures, Alternative Water Supply, and Operational Water Supply.



High Level Operational Response

From a strategic or high level perspective, it is important to understand the following:

- Elective changes
- Enforced changes
- Water conservation measures
- Water demand management measures
- Positive impacts
- Negative impacts



High Level Operational Response

Changes to system operation initiated by the operator to improve operation and/or management

Intervention to reduce the consumption/use of water

Intervention to improve the efficiency of the distribution of water

	Water Conservation Measures	Water Demand Management Measures
Elective Changes	- impact	+ impact
Enforced Changes		

Changes to system operation brought about by circumstances beyond the control of the operator



Balancing Competing Objectives

If responding to drought conditions while undertaking a Non-Revenue Water Reduction Program, be aware that certain drought response actions will have a negative impact on NRW, especially if %NRW is being used as a KPI.

This is particularly the case when restricting consumption. It is important therefore to quantify the impact of each intervention in advance and be aware of the consequence on any existing KPI's.



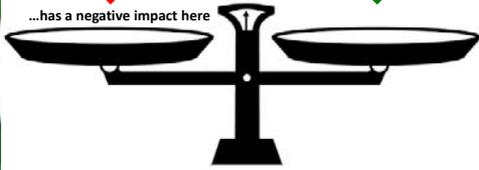
Balancing Competing Objectives

Often what is done here...

NRW Reduction Measures

Drought Response Measures

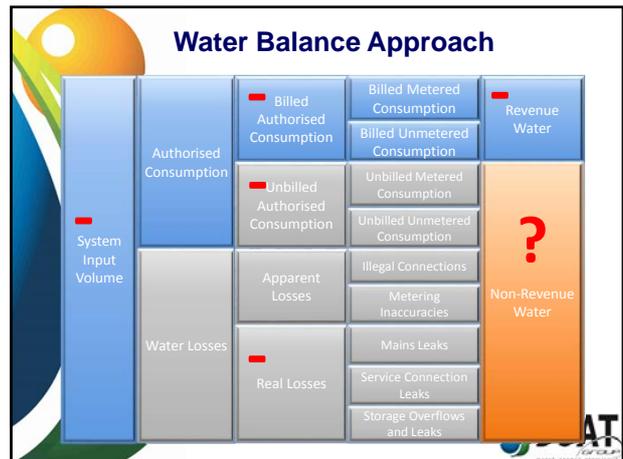
...has a negative impact here




Efficient & Practical Drought Response

In order to have an efficient and practical DRP, the following are essential:

- Base the drought response actions on an accurate water balance
- Develop the drought response actions around the water balance components
- Identify appropriate interventions
- Do not forget consumer awareness
- Be fully aware of the positive and negative technical impacts of each intervention
- Don't rely on one intervention only

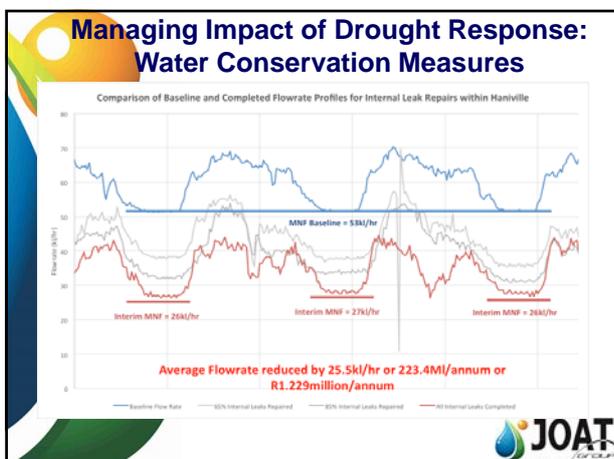
Managing Impact of Drought Response: Water Conservation Measures

Intervention	Description	Positive Impact	Negative Impact
Consumer restriction	Installation of restriction devices/washers to reduce consumption	Reduces consumption (only pressure dependent)	Damages meters; affects meter reading/accuracy; affects medium-term consumer habits; can increase network leakage
Punitive tariffs	Raising of tariffs to discourage use/abuse of water	Reduces consumption in low/middle income	Doesn't really affect high income (high usage) consumers
Forced repairs/retrofitting	Repair by water company to reduce water wastage	Reduces consumption	Sets ongoing precedent
Penalties	Financial penalty for non-compliance for consumption reduction	Reduces consumption in low/middle income	Doesn't really affect high income (high usage) consumers
Usage bans	Bans on types of water use (irrigation, hosepipes, etc)	Reduces consumption, but...	...difficult to enforce
Consumer education and awareness	Making consumers aware of water shortage in practical ways through high profile advertising (multi-media)	Educated consumers	Consumer apathy



Managing Impact of Drought Response: Water Conservation Measures

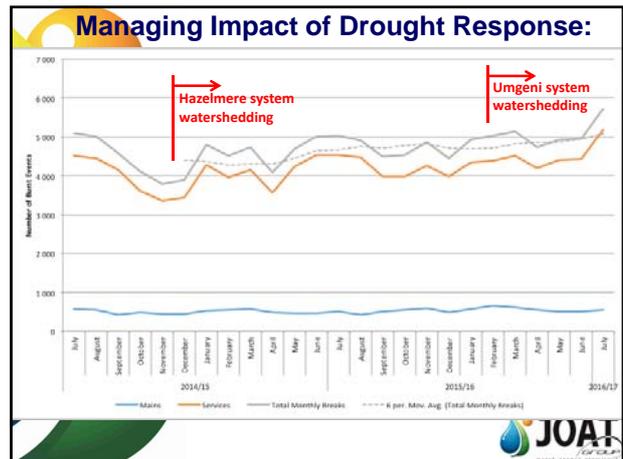
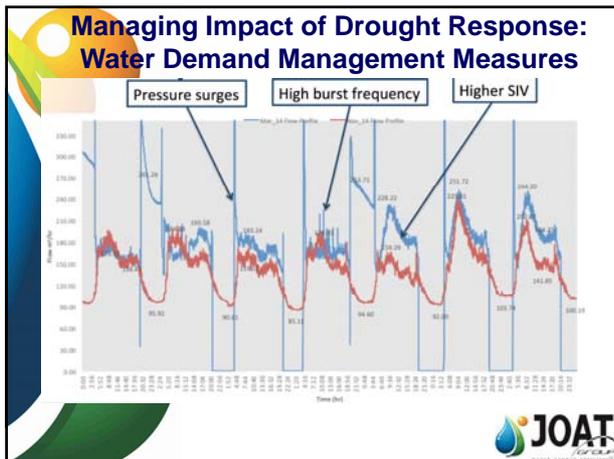
	12-month period (kl/day)	3-month period (kl/day)
Equivalent Billed Volume - pre-drought (2014/15FY)	590 009	
Equivalent Billed Volume - post-drought commencement	529 658	524 953
Equivalent Water Supplied - pre-drought (2014/15FY)	924 151	
Equivalent Water Supplied - post-drought commencement	893 651	871 994
% reduction Billed Volume	-10.2%	-11.0%
% reduction Water Supplied	-3.3%	-5.6%

Managing Impact of Drought Response: Water Demand Management Measures

Intervention	Description	Positive Impact	Negative Impact
Watershedding/intermittent supply	Shutting down of water at source/reservoirs into reticulation networks	None	Actually increases SIV; increased burst frequency, reduced asset life
Leak detection	Actively looking for leaks in networks (visual, mechanical etc)	Customer confidence, reduced leakage, extended asset life	None
Improved repair times	Improving on leak repair times	Customer confidence, reduced leakage	None
Pressure management	Reducing minimum supply pressures to 10m/15m	Reduced leakage, reduced burst frequency	Increased complaints (low pressures), compromised fire fighting capacity
Accelerated pipe replacement	Aggressively targeting replacement of problematic pipe sections	Reduced leakage	Interrupted water supply, possibly increased leakage
Alternative water supply	Bringing in bulk water from alternative water sources	Alleviates water stress	Masks real problem





- ### Managing Impact of Drought Response: Some Tricks...
- Obey operating rules even if they are unpopular
 - ALWAYS keep your consumers informed
 - The order of intervention is critical!! Don't drop/optimize pressure and then install consumer restrictors..
 - JOC/Coordination meetings need to have ALL stakeholders present (especially Finance and Technical)
 - Water shedding should always be the LAST resort
- JOAT**

- ### Monitoring and Evaluation
- When responding to a drought, and implementing drought response, choose appropriate KPI's, and be aware of the impact on any other initiatives (for example, NRW reduction programs, that may be underway).
- Examples of appropriate KPI's are:
- SIV reduction: %, per capita, per connection
 - Billed metered consumption reduction: %, per capita, per connection
 - % time system pressurised
 - Minimum supply system pressure
 - Leak isolation/repair time: % complete <6 hours/12 hours/24 hours
- JOAT**

