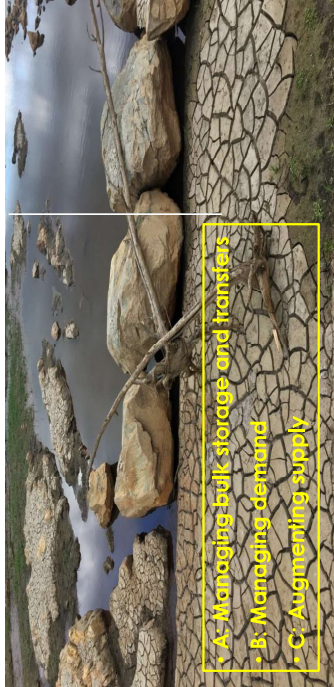




# Getting through the drought

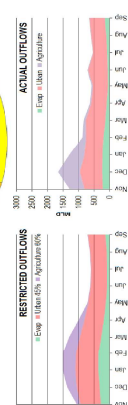
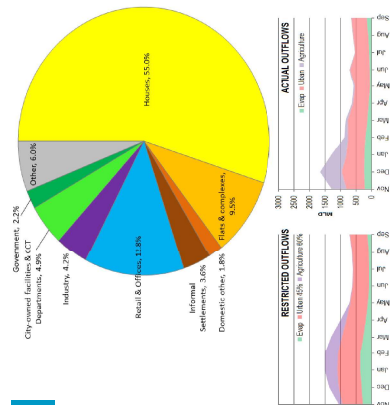


- A. Managing bulk storage and transfers
- B. Managing demand
- C. Augmenting supply

## A: Managing dam levels

### WCWS System Yield utilization:

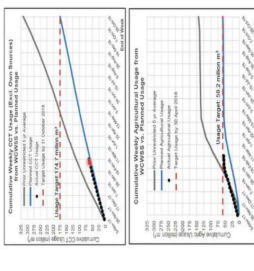
- 29% Agriculture - NDWS
- 7% Other urban - NDWS & CCT
- 64% City of Cape Town
  - Residential 70%
  - Commerce 13%
  - Industry 4%
  - Govt & other 13%



## A: Managing dam levels

### WCWS and City Operations

- Yield maximized through City's BW Infrastructure
- System model provides management information for operational optimization



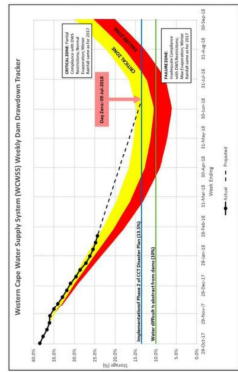
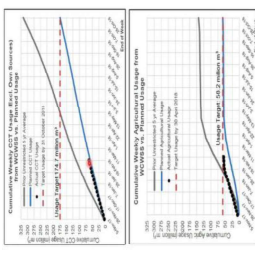
### Day Zero graph explained:

- The "Day Zero" term was generally understood to mean the day CT ran dry.
- We couldn't kill the term in the media and we chose to use it, but define it in our own way.
- Our own definition of Day Zero was the day when we reached the restricted allocation for the season.
- To get the date of this Day Zero, you project the line based on the decline in dam level in the past week extrapolated forward and where that line intersects the 13.5% capacity line would give the date. At 13.5% there would be no water available for the City of Cape Town.
- On the 22nd January 2018 the Mayor of CT announced that Day Zero would be 12th April 2018. The news moved rapidly around the world.....

## A: Managing dam levels

### WCWS and City Operations

- Yield maximized through City's BW Infrastructure
- System model provides management information for operational optimization



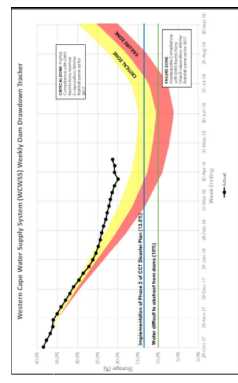
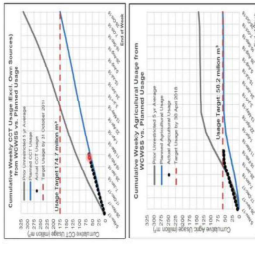
In the following week 3 things happened which flattened the slope of the line and moved the Day Zero projection forward in time:

- The Nation Department of Water & Sanitation shut off supply to the area when they reached the restricted allocation for the season
- A significant volume of additional water was transferred from a neighbouring catchment which still had very high storage levels.
- There was a change in consumer behaviour resulting in a significant reduction in domestic demand

## A: Managing dam levels

### WCWS and City Operations

- Yield maximized through City's BW Infrastructure
- System model provides management information for operational optimization



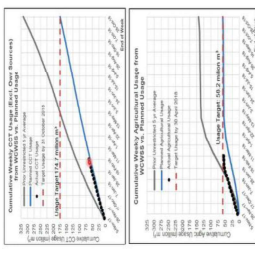
The intersection point continued to move forward in time as the restricted allocation was reduced. The date of Day Zero was no longer relevant in that hydrological year.

- However Day Zero could still occur in the following year if there was another very poor rainy season in the next cycle.

## A: Managing dam levels

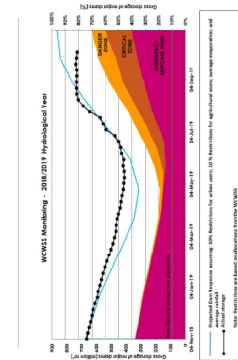
### WCWS and City Operations

- Yield maximized through City's BW Infrastructure
- System model provides management information for operational optimization



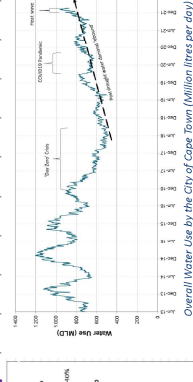
This graph, also published weekly, showed the actual tracking of the dam levels against the modelled curve for:

- average evaporation
- Average rainfall
- And the relevant restriction levels at the time for urban and agriculture



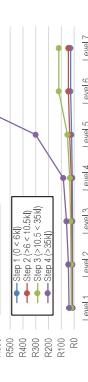
Cape Town Seasonal Demand  
Million litres per day (MLD)

- 



Definitions

- World Health Organisation (standard 50 litres per capita per day (l/cap) = 7 buckets)
- Equal allocation of water to indigent households (8' l/cap) = 12 buckets
- Equal De-weight (-220 l/cap) = 35 buckets
- Equal During the drought (-120 l/cap) = 15 buckets
- Domestic Traffic
- 1 Euro = 14,5 ZAR in 2018
- €69



- 
- WATER**
- BEAT DAY ZERO**  
10% OR LESS PER DAY
- HOW FAR CAN 87% A DAY GO?**
- YOUR GUIDE TO THE 50 / LIFE**



100%

- Figure 1 consists of three parts: a map of the study area, a table of water quality parameters, and a bar chart of water quality parameters.

The map shows the location of the study area within the state of Karnataka, India. The map includes the following information:

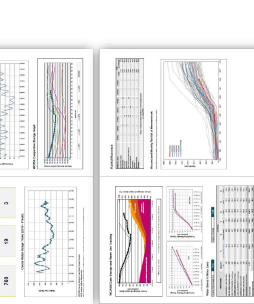
  - State: Karnataka
  - District: Channarayana
  - Taluk: Channarayana
  - Village: Channarayana
  - Pin Code: 576 101

The table of water quality parameters is as follows:

| Parameter                       | Unit | Value |
|---------------------------------|------|-------|
| Temperature                     | °C   | 28.5  |
| pH                              |      | 7.2   |
| Dissolved Oxygen                | mg/l | 8.5   |
| Biochemical Oxygen Demand (BOD) | mg/l | 0.1   |
| Chemical Oxygen Demand (COD)    | mg/l | 0.2   |
| Total Dissolved Solids (TDS)    | mg/l | 150   |
| Total Suspended Solids (TSS)    | mg/l | 10    |
| Calcium                         | mg/l | 120   |
| Magnesium                       | mg/l | 80    |
| Hardness                        | mg/l | 200   |
| Chloride                        | mg/l | 10    |
| Sulfate                         | mg/l | 10    |
| Nitrate                         | mg/l | 10    |
| Ammonia                         | mg/l | 10    |
| Phosphate                       | mg/l | 10    |
| Iron                            | mg/l | 10    |
| Copper                          | mg/l | 10    |
| Zinc                            | mg/l | 10    |
| Lead                            | mg/l | 10    |
| Cadmium                         | mg/l | 10    |
| Chromium                        | mg/l | 10    |
| Manganese                       | mg/l | 10    |
| Selenium                        | mg/l | 10    |
| Fluoride                        | mg/l | 10    |
| Boron                           | mg/l | 10    |
| Silica                          | mg/l | 10    |
| Aluminum                        | mg/l | 10    |
| Barium                          | mg/l | 10    |
| Strontium                       | mg/l | 10    |
| Lithium                         | mg/l | 10    |
| Sodium                          | mg/l | 10    |
| Potassium                       | mg/l | 10    |
| Calcium                         | mg/l | 10    |
| Magnesium                       | mg/l | 10    |
| Hardness                        | mg/l | 10    |
| Chloride                        | mg/l | 10    |
| Sulfate                         | mg/l | 10    |
| Nitrate                         | mg/l | 10    |
| Ammonia                         | mg/l | 10    |
| Phosphate                       | mg/l | 10    |
| Iron                            | mg/l | 10    |
| Copper                          | mg/l | 10    |
| Zinc                            | mg/l | 10    |
| Lead                            | mg/l | 10    |
| Cadmium                         | mg/l | 10    |
| Chromium                        | mg/l | 10    |
| Manganese                       | mg/l | 10    |
| Selenium                        | mg/l | 10    |
| Fluoride                        | mg/l | 10    |
| Boron                           | mg/l | 10    |
| Silica                          | mg/l | 10    |
| Aluminum                        | mg/l | 10    |
| Barium                          | mg/l | 10    |
| Strontium                       | mg/l | 10    |
| Lithium                         | mg/l | 10    |
| Sodium                          | mg/l | 10    |
| Potassium                       | mg/l | 10    |

The bar chart shows the water quality parameters and their values. The parameters are listed on the x-axis, and the values are shown on the y-axis. The parameters and their values are:

  - Temperature: 28.5
  - pH: 7.2
  - Dissolved Oxygen: 8.5
  - Biochemical Oxygen Demand (BOD): 0.1
  - Chemical Oxygen Demand (COD): 0.2
  - Total Dissolved Solids (TDS): 150
  - Total Suspended Solids (TSS): 10
  - Calcium: 120
  - Magnesium: 80
  - Hardness: 200
  - Chloride: 10
  - Sulfate: 10
  - Nitrate: 10
  - Ammonia: 10
  - Phosphate: 10
  - Iron: 10
  - Copper: 10
  - Zinc: 10
  - Lead: 10
  - Cadmium: 10
  - Chromium: 10
  - Manganese: 10
  - Selenium: 10
  - Fluoride: 10
  - Boron: 10
  - Silica: 10
  - Aluminum: 10
  - Barium: 10
  - Strontium: 10
  - Lithium: 10
  - Sodium: 10
  - Potassium: 10

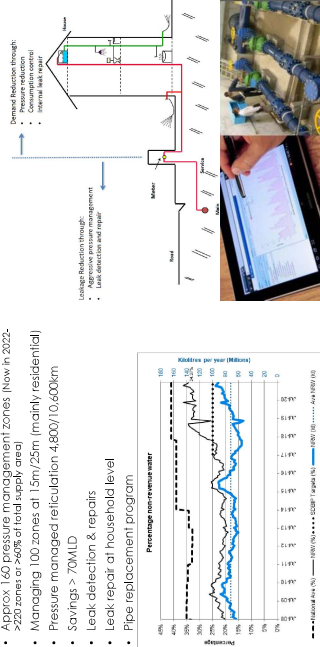


**P: WDM**    **Flow Restrictors**

- Leak repair programme ~190,000 of 268,000 households done
- All meter replacements use these restrictors, but not set
- In September 2017 look decision to install at households using >20M/month
- ~60,000 installed

## B: WDM – Pressure Management & Leak Detection

- Approx. 160 pressure management zones (now in 2022).
- Also some 800 of informal settlements (mainly residential)
- Pressure managed reticulation 4,800/10,600km
- Savings > 70MLD
- Leak detection & repairs
- Leak repair at household level
- Pipe replacement program



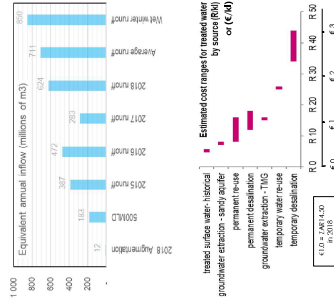
## Water Demand Management - Impact

**International Water Association recognition for a 55% reduction in water demand between 2015 – 2017, without resorting to intermittent supply.**



## C: Augmenting Supply

- Water sources:**
  - New surface water;
  - Improve yield of existing surface water:
    - System management;
    - Invasive alien plant removal
- Groundwater;
- Water re-use;
- Desalination



## Looking to the FUTURE: Cape Town Water Strategy

### 5 Commitments:

**Commitment - (a willingness to give our time and energy to something that we believe in, a resolve, a firm decision to do something)**

1. We will work hard to provide **safe access to water & sanitation**
2. We will promote **wise use** by all water users
3. We will ensure **sufficient, reliable water from diverse sources**
4. We will work with our partners to guarantee **increased & shared benefits from regional water resources**
5. We will actively facilitate the transition to a **water sensitive city**

Link to current version of the Water Strategy on City of Cape Town website:

<http://resource.cape.gov.za/documentcentral/Documents/City%20strategies,%20plans%20and%20frameworks/Cape%20City%20Water%20Strategy.pdf>

## INCREASE RESILIENCE TO CHANGE

**Our commitment:** The City will work hard to provide and facilitate safe access to water and sanitation for all of its residents in terms of well-defined minimum standards. In particular, the City will work with communities in informal settlements and with other stakeholders to improve the daily experience of access to water and sanitation, with an emphasis on building trust and increasing safety within these communities through this process.

- The Focus on people is critical to re-establish the trust eroded in the drought
- The inequality in society is stark – during the drought there was repeated insensitive media attacks on informal settlements wasting water.
- We believe that we need to put people first and emphasize our commitment to vulnerable people
- One of our main commitments to customer centricity is to improve the lived experience of residents in informal settlements.
- Formal services perform well in the context of SA measures – meeting and exceeding blue, green and no-drop standards.
- Standards in informal settlements have been exceeded, but there is great room for improvement.



### COMMITMENT 1

## SAFE ACCESS TO WATER & SANITATION

**Our commitment:** The City will work hard to provide and facilitate safe access to water and sanitation for all of its residents in terms of well-defined minimum standards. In particular, the City will work with communities in informal settlements and with other stakeholders to improve the daily experience of access to water and sanitation, with an emphasis on building trust and increasing safety within these communities through this process.

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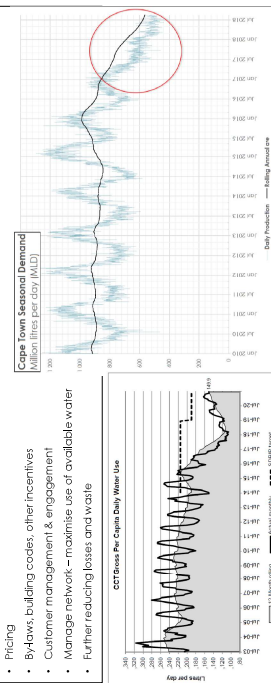


### COMMITMENT 2

## WISE USE

**Our commitment:** The City will promote the wise use of water by all water users. This will include promoting water conservation behaviour through:

- Pricing
- By-laws, building codes, other incentives
- Customer management & engagement
- Manage network – maximise use of available water
- Further reducing losses and waste



## SUFFICIENT, RELIABLE WATER

**Our commitment:** The City will develop new diverse supplies of water – including ground water, water reuse and desalinated water, cost-effectively and flexibly to increase resilience and substantially reduce the risk of Cape Town needing to impose severe water restrictions in the future. The City is committed to building affordable new capacity of some 300 million litres per day over the next ten years, and in suitable increments thereafter, in a way that is adaptable and robust to changes in circumstances.

### APPROACH

- Planning in the context of uncertainty through scenarios;
- Future water demand is uncertain because of the very disruptive effect of the drought;
- Future water availability from rainfall is uncertain because of climate change.

**STRESS TEST SCENARIOS**

- Business as usual
- Low demand
- Climate stress



## SUFFICIENT, RELIABLE WATER (cont'd)

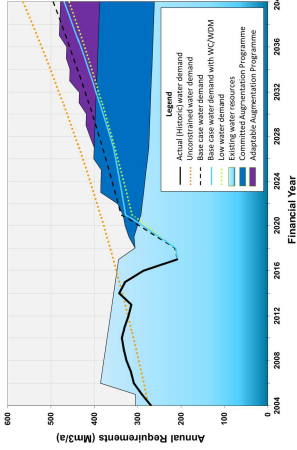
### THE NEW WATER PROGRAMME – COMMITTED AND ADAPTABLE

#### Founding Principles:

- Low cost first-WDMA, AIP removal, improve surface water management
- Existing funding commitments;
- Timing;
- Diversification and early learning;
- Adaptability and scalability;
- Earlier than needed;
- Phasing.

#### Water sources:

- New surface water;
- Improve yield of existing surface water – Invasive alien plant removal;
- Groundwater;
- Water reuse;
- Desalination



COMMITMENT 3

## SUFFICIENT, RELIABLE WATER (cont'd)

### THE NEW WATER PROGRAMME – 10 YEAR VIEW

| Intervention                     | First Water | Effective yield Ml/day | Total Capex Rm YLD | Opex Capex Rm YLD | Operating R/L |
|----------------------------------|-------------|------------------------|--------------------|-------------------|---------------|
| <b>Demand management</b>         | 2019        | 70                     | 26                 | 6                 | 3             |
| <b>Alien vegetation clearing</b> | 2019        | 53                     | 20                 |                   | -1.2          |
| <b>Management of MCVSS</b>       | N/A         | 27                     | 10                 |                   | -0.2 to 0.5   |
| <b>Cape Flats Aquifer P1</b>     | 2020        | 20                     | 7.3                | 41.0              | 31            |
| <b>Table Mountain Group P1</b>   | 2020        | 15                     | 5.5                | 37.5              | 5             |
| <b>Cape Flats Aquifer P2</b>     | 2021        | 25                     | 9.1                | 45.0              | 18            |
| <b>Atlantis Aquifer</b>          | 2021        | 10                     | 4                  | 290               | 29            |
| <b>Table Mountain Group P2</b>   | 2022        | 15                     | 5.5                | 33.5              | 23            |
| <b>Table Mountain Group P3</b>   | 2022        | 20                     | 7.3                | 326               | 16            |
| <b>Berg River Augmentation</b>   | 2023        | 40                     | 15                 |                   | -3.5          |
| <b>Water Re-use P1</b>           | 2024        | 20                     | 26                 | 136.0             | 20            |
| <b>Desalination Phase 1</b>      | 2025        | 50                     | 18                 | 145.0             | 33-40         |
| <b>Total including MCM</b>       |             | 417                    | 154                | 586.6             |               |
| <b>Total new supply</b>          |             | 347                    | 128                | 539.6             |               |

1 USD = 14.24R

| Intervention                 | Supply Ml/day |
|------------------------------|---------------|
| Ground water (rather phases) | 50            |
| Reuse schemes (2+ phases)    | 100           |
| Surface water (new scheme)   | 100           |
| Total                        | 250           |

- Trade-off between the reliability of water supply and its cost
- Resilient & reliable to become less reliable in future
- Doing nothing is not an option
- New and diverse supplies will increase reliability
- The City will plan for a higher level of reliability (76-77.5%)
- The city will adopt scenario planning with annual reviews
- The committed program balances risk and cost.

COMMITMENT 3

## SUFFICIENT, RELIABLE WATER (cont'd)

Table 1: Timing of New Water Programme project (as at November 2021)

| Description                                    | Water Strategy | Completion / First Water Date | Revision | Nov 2020 | Revision | Nov 2021 |
|------------------------------------------------|----------------|-------------------------------|----------|----------|----------|----------|
| Table Mountain Steenberg Phase 1               | 2020           | Jul-20                        | Jul-21   |          |          |          |
| Table Mountain Nuvemberg Phase 2               | 2022           | Dec-26                        | Jun-25   |          |          |          |
| Table Mountain Groenlandberg Phase 3           | 2022           | Jun-28                        | Jul-31   |          |          |          |
| CFA Strandfontein West                         | 2020           | Jun-21                        | Mar-22   |          |          |          |
| Cape Flats Aquifer: Hanover Park               | 2021           | Jun-24                        | Jun-24   |          |          |          |
| Cape Flats Aquifer: Strandfontein North & East | 2021           | Dec-25                        | Dec-25   |          |          |          |
| Cape Flats Aquifer: Philippi                   | 2021           | Jun-26                        | Jun-26   |          |          |          |
| CFA Mitchell's Plain WTP                       | 2021           | Jun-27                        | Jun-27   |          |          |          |
| Atlantis Aquifer                               | 2021           | Jun-24                        | Jun-24   |          |          |          |
| Berg Veeheid River Augmentation Scheme         | 2023           | Jun-24                        | Jun-25   |          |          |          |
| Faure New Water Scheme Phase 1                 | 2024           | Jun-26                        | Nov-27   |          |          |          |
| Desalination Phase 1                           | 2026           | Jun-28                        | Feb-30   |          |          |          |

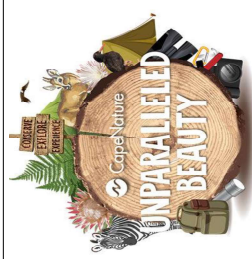
COMMITMENT 4

## INCREASED SHARED BENEFITS FROM REGIONAL WATER RESOURCES

- Our commitment:** The City will work with key stakeholders and partners, including other urban and agriculture water users, and other spheres of government, to make the most of the opportunities to optimise the economic, social and ecological benefits of regional water resources, and to reduce the risks. The City will do this through collaborative processes. Regional refers to the region served by the MCVSS (Western Cape Water Supply System).

#### ENGAGE & COLLABORATE

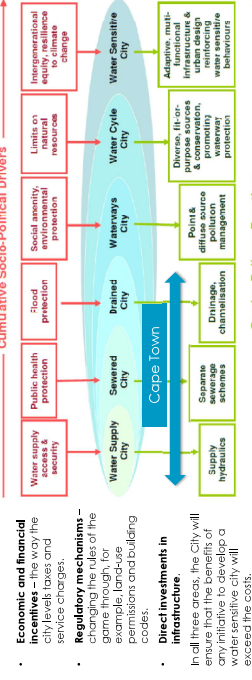
- Shared benefits
- Shared risks
- Options for the future
  - Amending and developing legal agreements – water rights
  - Better system management information with improved sharing
  - Professionalising the management of the MCVSS
  - More inclusive and robust governance structure for the MCVSS
- A collaborative approach
  - Improve the analytical information-base
  - Build stronger relationships between the key stakeholders
  - Optimise the overall economic and social benefit of water
  - Improve water resource management to ensure resilient outcomes
  - Involve institutional arrangements between the users and the DWS
  - Ensure more robust and transparent management of water resources.



COMMITMENT 5

## A WATER SENSITIVE CITY

**Our commitment:** The City will transform the city over time into a water sensitive city that makes optimal use of stormwater and urban waterways for the purposes of flood control, aquifer recharge, water reuse and recreation, and is based on sound ecological principles. This will be done through new incentives and regulatory mechanisms as well as the way the city invests.



## EMERGING LESSONS FROM THE DROUGHT – Developing resilience

- **Cape Town is vulnerable to climate-change related risks**
  - Prepare for droughts – don't wait till they occur
  - Have action plans with determined trigger points in place ready for when the first signs of the next drought are recognised
- **Regional resource risks need to be better managed**
  - Agreed operating rules must be adhered to by all parties
  - Necessary releases and transfer must be done timeously
  - Better catchment management – including seriously addressing removal Alien Invasive Plants
  - Nurture better cooperation amongst the three tiers of government
- **Need to build ahead of time & diversify resources.**
  - Risks can be further reduced through resource diversification, which is **less dependent on rainfall**
  - Cannot build a way out of a drought – focus short term plans during the drought on demand management

## EMERGING LESSONS FROM THE DROUGHT – Developing resilience

- **Responsive, effective and consistent communications strategy (internal & external)**
  - Awareness raising, partnering and promote citizenry
  - Fake news management      - Day Zero
- **Need to Sustain Water Conservation and Demand Management Practices**
  - In the department and support household resilience development
- **Accurate metering**
  - To measure it to know. What gets measured .....gets managed.
  - Leads to improvement in NRW and results in better revenue management and ultimately revenue increase
- **Leak detection and repair program**
  - Basic detection methods with simple training of large teams to supplement high-tech methods

## EMERGING LESSONS FROM THE DROUGHT – Developing resilience

- **Pressure management**
  - Create isolated zones supplied through PRVs and controllers (if required)
  - This provides ability to limit usage in severe droughts without resorting to intermittent supply.
  - Avoid intermittent supply at all costs (health and infrastructure damage risks)
- **Price water appropriately to affordability**
- **Advance Water Sensitive City Concept**
  - Manage a fully integrated urban water cycle
- **National Supply Chain Regulations**
  - Emergency provisions – to avoid qualified audits. Enable effective response in times of crisis.