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Water Safety Planning: Managing catchment risks

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WEBINAR

9 June 2022 | 09:00 BST

iwa-network.org/webinars

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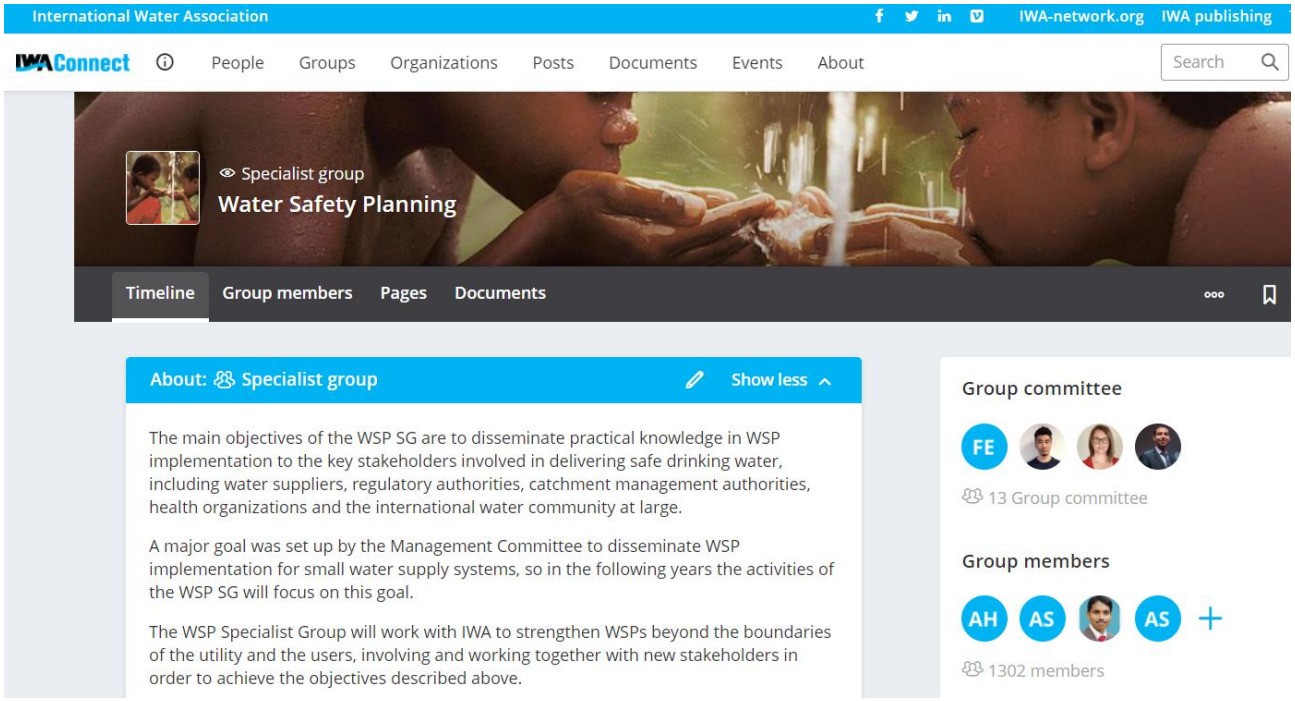
IWA WATER SAFETY PLANNING SG



The **IWA WSP Specialist Group** aims to disseminate practical knowledge in WSP implementation to the key stakeholders involved in delivering safe drinking water, including water suppliers, regulatory authorities, catchment management authorities, health organizations and the international water community at large.

Join the IWA WSP SG on IWA Connect!

https://iwa-connect.org/group/water-safety-planning/timeline?searchFor=all

IWA WSP CONFERENCE

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Organizers

THE ARCTIC UNIVERSITY OF NORWAY • UIT •

CHALMERS UNIVERSITY OF TECHNOLOGY

CONFERENCE ANNOUNCEMENT AND CALL FOR PAPER

WATER SAFETY CONFERENCE 2022

22 – 24 June 2022

Narvik, Norway

Bring together leading international experts, share the state-of-the-art research, and contribute knowledge to the key stakeholders

IWA WSP CONFERENCE

WEBINAR INFORMATION

- This webinar will be **recorded and made available "on-demand"** on the IWA website, with presentation slides, and other information.
- The **speakers** are responsible for **securing copyright permissions** for any work that they will present of which they are not the legal copyright holder.
- The opinions, hypothesis, conclusions or recommendations contained in the presentations and other materials are the **sole responsibility of the speaker(s)** and do not necessarily reflect IWA opinion.

WEBINAR INFORMATION

- **'Chat' box**: please use this for general requests and for interactive activities.
- **'Q&A' box**: please use this to send questions to the panelists. (We will answer these during the discussions)

Please Note: *Attendees' microphones are muted. We cannot respond to 'Raise Hand'.*

AGENDA

- Welcome, introduction, housekeeping rules
  Philip de Souza
- Overview of typical water safety planning requirements
  Asoka Jayaratne
- Poll
- Challenges in identifying and managing risks in catchments in Sri Lanka
  Jayalal Wijesinghe
- Water Safety Planning Process at Catchment Management Level: Lessons Learnt from South Africa
  Thabisa Manxodidi
- Catchment and Source Water Management for Sydney, Australia
  Andrew Ball
- Poll and Q&A Panel Discussion
- Final remarks and conclusion
  Asoka Jayaratne

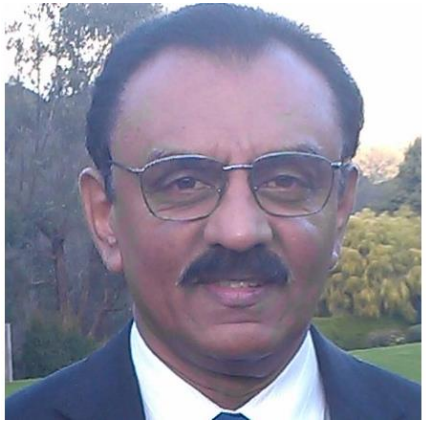
MODERATOR & PANELISTS

Philip de Souza
Emanti Management, South Africa

Thabisa Manxodidi
Emanti Management, South Africa

Andrew Ball
Water New South Wales, Australia

Jayalal Wijesinghe
National Water Supply &
Drainage Board, Sri Lanka

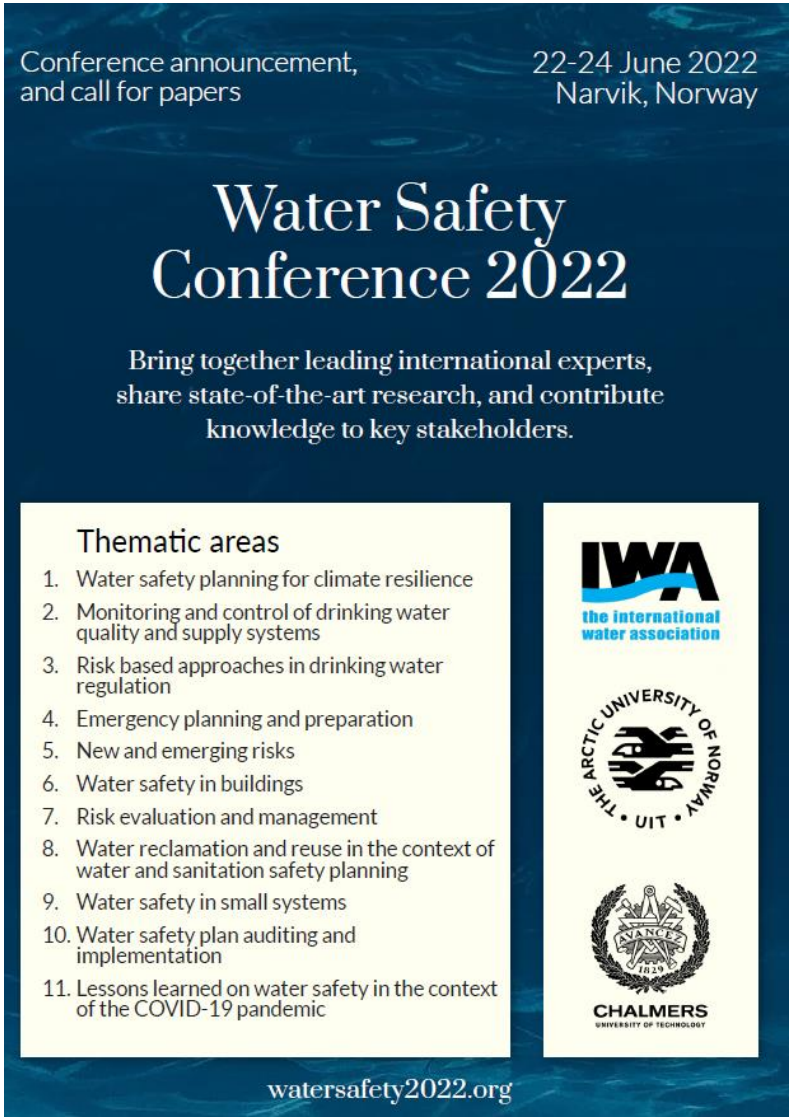


Asoka Jayaratne
Yarra Valley Water, Australia

LEARNING OBJECTIVES

1. Learn about best practices utilities are applying to manage development and implementation of Water Safety Plans.
2. Identify needs and requirements for successfully implementing a digital tool to manage water safety planning activities.
3. Draw from the experiences presented to assist to choose the appropriate tool to local settings for the development and implementation of robust and resilient water safety planning that enable utilities to rapidly respond to hazards and risks.

SHARE YOUR THOUGHTS ON SOCIAL MEDIA



Tag @IWAHQ on social media and tell us:

Why WSP is important?

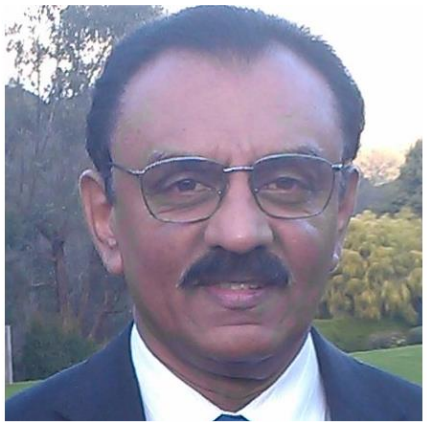
How does it affect your life?

What is the main contribution to the SDG6 and the 2030 Agenda?

Don't forget to include the hashtags #IWA & #WSP.

Overview Typical Water Safety Planning Requirements

ASOKA JAYARATNE, YARRA VALLEY WATER, AUSTRALIA



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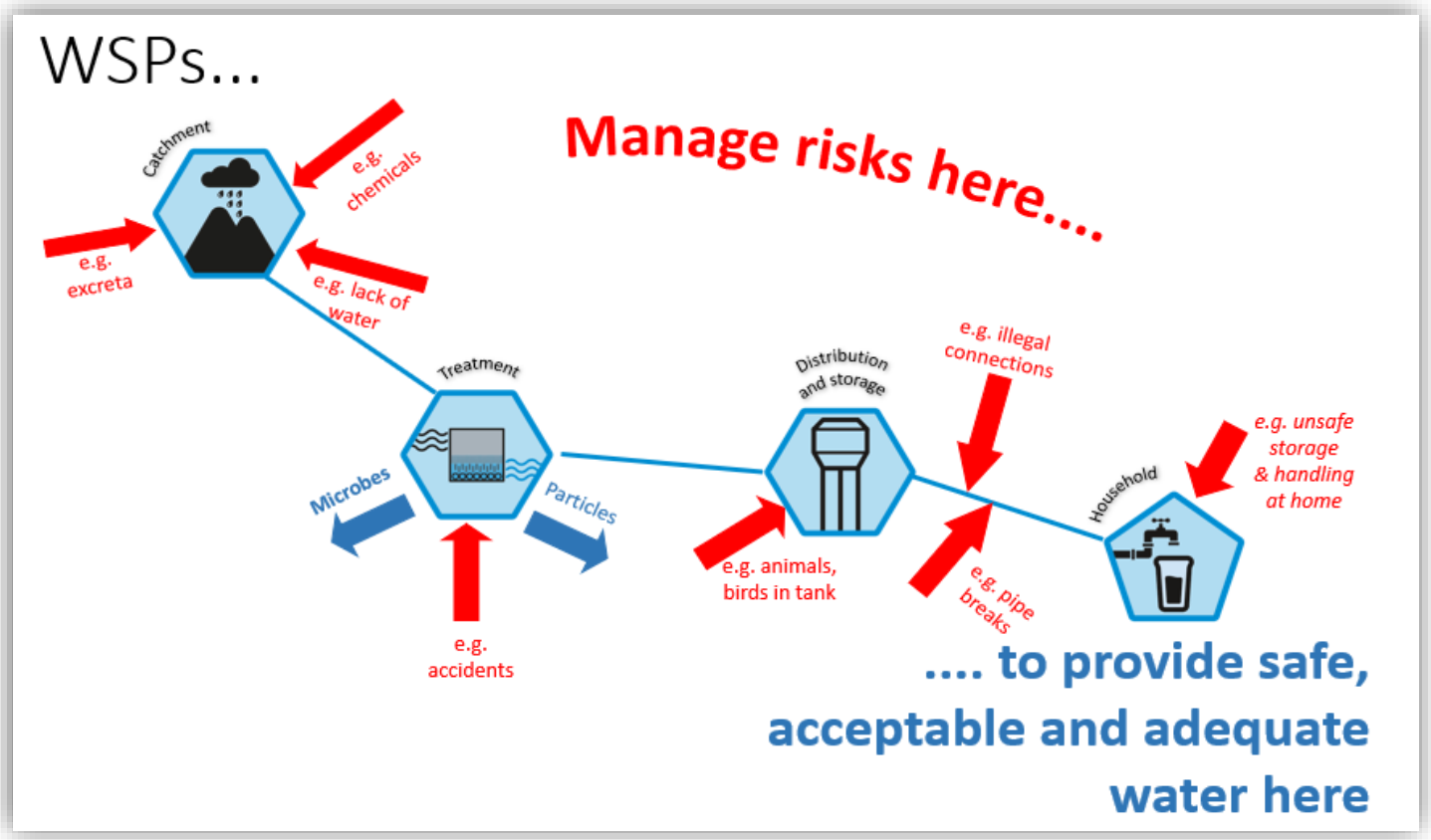
INTRODUCTION TO WATER SAFETY PLAN REQUIREMENTS

- What is a water safety plan (WSP)?
- What are the benefits of WSP?
- What are the key features?

WATER SAFETY PLANNING

A comprehensive *risk assessment and risk management* approach that *includes all steps* in the water supply from catchment to consumer



CATCHMENT TO TAP (CONSUMER)

- Prevention at the earliest step in the process
- Prevention at the catchment
- Multiple Barriers



WATER SAFETY PLANNING FRAMEWORK

1. WSP team formation
2. System description
3. Hazard identification
4. Risk assessment
5. Improvement planning
6. Operational monitoring
7. Verification
8. Management procedures
9. Supporting programmes
10. Review and revision (regular)
11. Review and revisions (incident)

WHO/IWA (2009)

WATER SAFETY PLANNING BENEFITS

1. Safe and clean water 100% of the time
2. Drives continuous improvement (not a static document)
3. Focus on prevention than end product testing
4. Significant reduction in potential contamination events
    a. Microbiological events → e.g. E.coli detections
    b. Treatment plant operations
    c. Ingress in the distribution network
    d. Staff and stakeholder engagement and awareness
5. Preparedness for unforeseen events → incidents and emergencies

Source: https://www.abc.net.au/news/2020-08-28/yarra-valley-water-users-told-to-boil-water-after-storms/12605930

WSP BENEFITS

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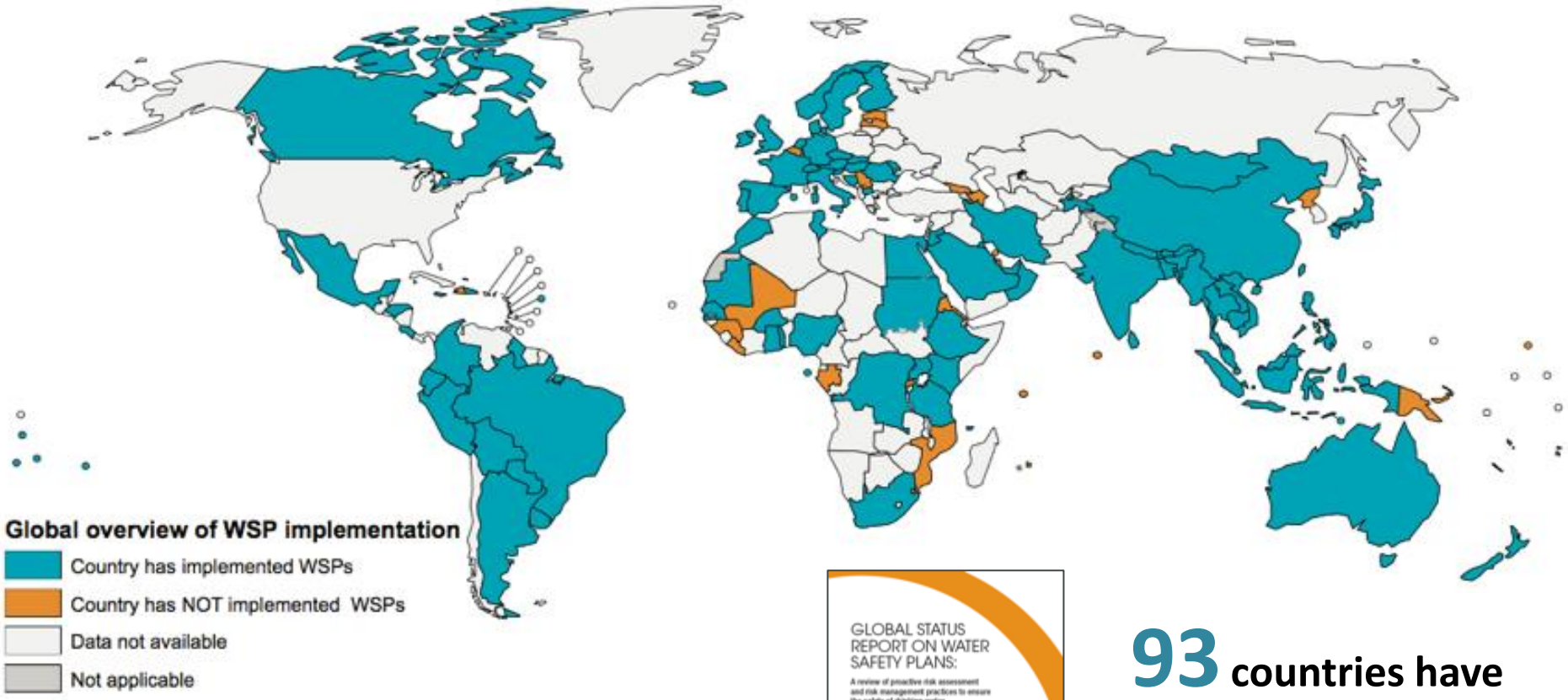


WHO (2017). Global status report on water safety plans.

Geneva, Switzerland.

93 countries have implemented WSPs

World Health Organization

FOR MORE INFORMATION

- WHO Water, Sanitation, Hygiene
  www.who.int/water_sanitation_health

- Water Safety Portal (WSPortal)
  www.wsportal.org

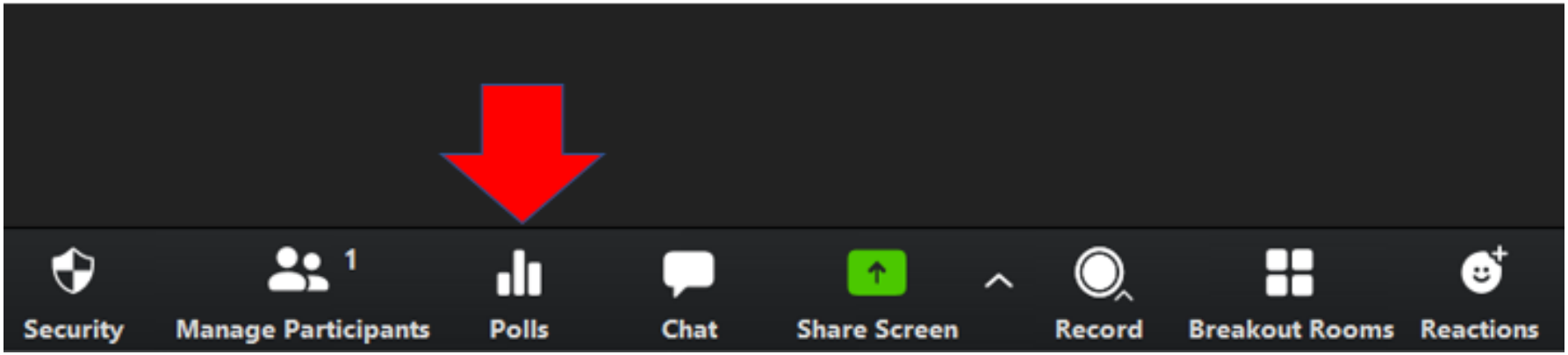
Credit: depositphotos: cosmicpony

Poll

MODERATOR: PHILIP DE SOUZA

POLL

Poll: Is it easy to involve catchment/basin management authorities within utility-based water safety planning activities?



Participate in the poll and share your answer with us!

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CHALENGES IN IDENTIFYING & MANAGING RISKS IN CATCHMENT IN SRI LANK

JAYALAL WIJESINGHE, NATIONAL WATER SUPPLY & DRAINAGE BOARD SRI LANKA

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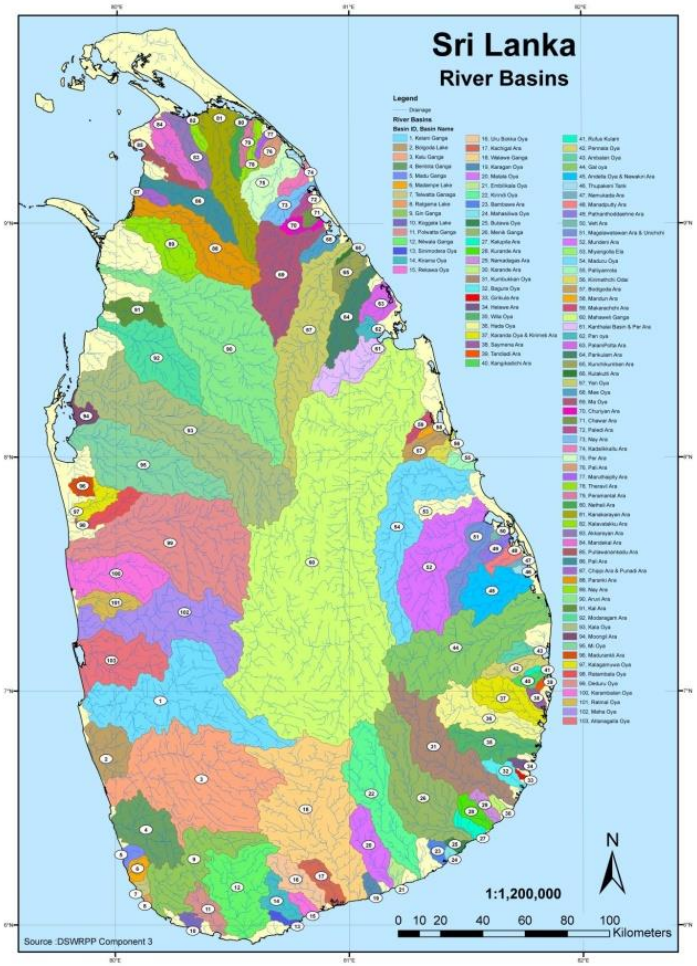
CONTENT

- Country profile
- Risk identification in catchment
- RISK MANAGEMENT IN CATCHMENT
- CASE STUDIES – SRI LANKA
- WAY FORWARD

COUNTRY PROFILE – POPULATION & WATER SOURCES

- 80 Km southeast to the Indian Subcontinent
  North Latitude 5º 55' & 9º 50'
  East Longitude 79º 31' & 81º 53'
- Area 65,612 Km2
  Land 62, 709
  Inland waters 2905
- Coastline 1585 Km
- Mid year population ('000)(2020) - 21,919
- Population Density - 350 persons / sq.km
- Average Household size - 3.8 persons
- Expectation of Life at Birth (2017) - 75.5 years
- Literacy Rate (2019) - 92.9 %



Water Source	No
River Basins	103
Ramsar Wetlands	06
Major Reservoirs	73
Medium Reservoirs	171

CLIMATE – TROPICAL WITH MONSOON RAINS TOPOGRAPHY - FLAT WITH CENTRAL HILLS

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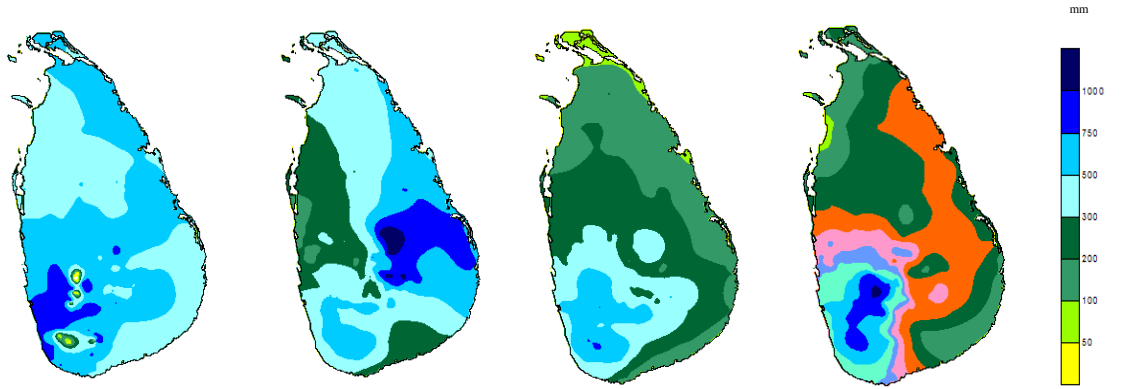
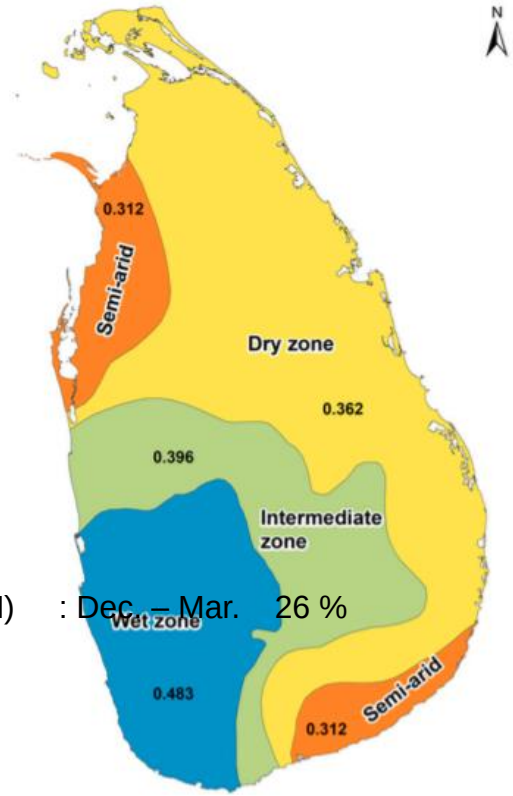
- Four major climatic zones (Avg. rainfall/year mm)
  1. Wet zone : > 2500
  2. Intermediate Zone : 1900-2500
  3. Dry Zone : 1200-1900
  4. Semi Arid Zone : 800-1200





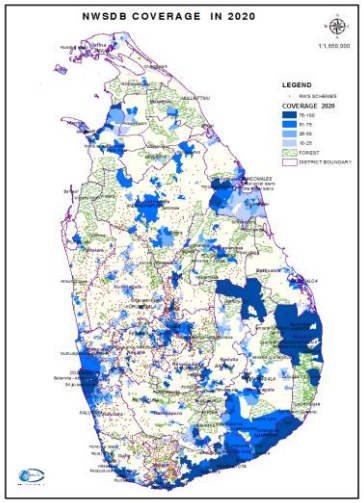
1. First Inter Monsoon (FIM) : March – April 14 %
2. South West Monsoon (SWM): May – Sept. 30 %
3. Second Inter Monsoon (SIM) : Oct. – Nov. 30 %
4. North east Monsoon (NEM) : Dec. – Mar. 26 %

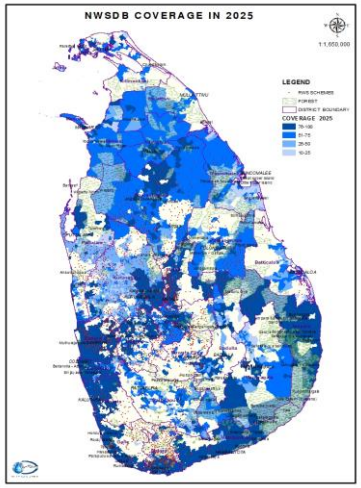
NWSDB - PLAN FOR DRINKING WATER

- **UN definition for "Access to Water"**
- Quantity 20 l/person/day
- Quality No biological or chemical agents detrimental to health
- Distance for collecting < 200 m

No	Description	2020	2025
1	Water Production (M^3 / day) ('000)	2,089	4,445
2	No. of families (Covered) (NWSDB-Direct and Bulk with LAs)	2,305,933	4,685,725
3	Coverage (NWSDB)	40.0%	79 %
4	No. of families (Covered) (CBOs) (LAs & Others)	789,782	1,260,627
5	Coverage (CBO & Improved Domestic Water Sources)	13.7 %	21.2%
6	Length of distribution network (Km)	44,200	84,200

Population Density (Persons/ Km^2)	Category	Per Capita Consumption (liter/capita/day)
	Highly Developed Area	180 – 200
> 10,000	Urban	140 – 160
2000 to 10,000	Semi Urban	120 – 140
0 to < 2000	Rural	100 – 120
	Water Scarce areas	60

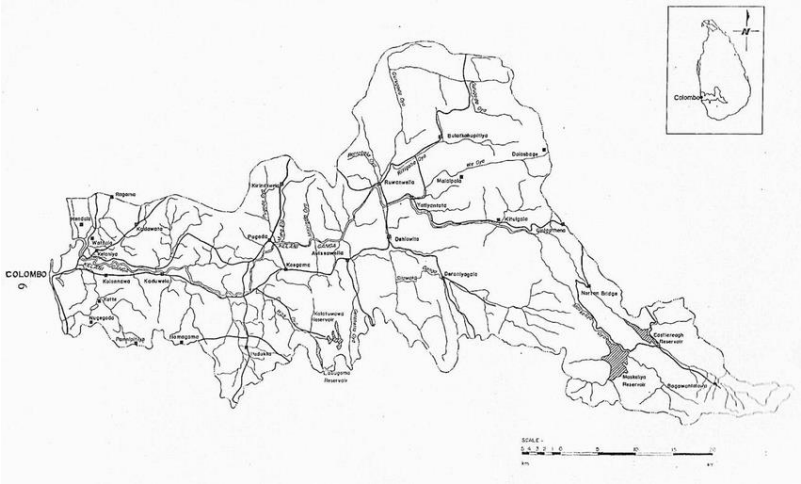




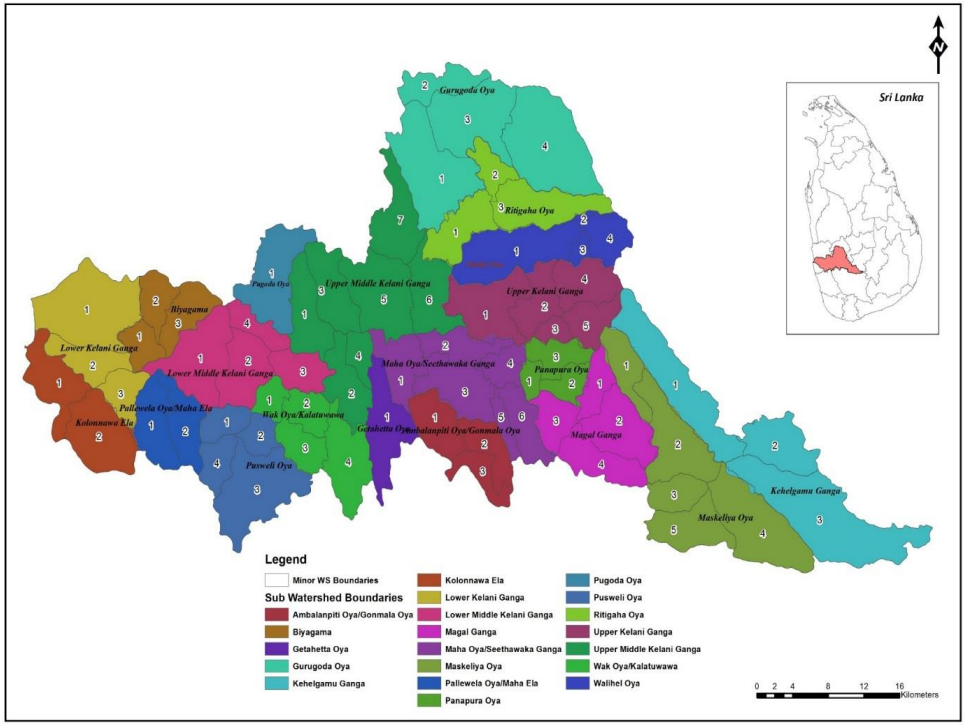
No of WSS=357
No of WTPs=302

RISK IDENTIFICATION - KELANI RIVER

- The Kelani is the second largest river basin and the fourth longest river in Sri Lanka
- It originates from the Western face of the central highlands in the Horton Plains National Park
- Drains about 2,300 sq. km., annual rainfall about 3,250 mm (7,865 Million Cubic Meters (MCM) of water from rain) with about 43% of rainfall ending in Indian Ocean
- Home to 25% of Sri Lanka's population
- Provides drinking water to millions of people in Greater Colombo including proposed Western Region Megapolis
- Supports over 10,000 small and large scale industries
- Supports livelihoods through agriculture, mining, urban services, ecosystems etc.



KELANI RIVER BASIN



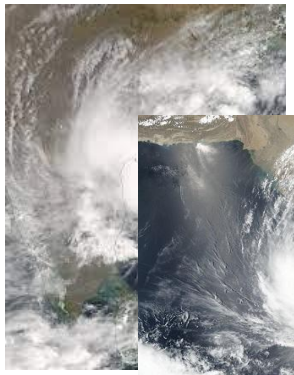
- Consisted of **20 sub-watersheds**, **71 minor watersheds** with **37 local authorities and 36 Divisional Secretariat divisions**; over 750 schools; private sector such as large industries, small and medium enterprises and independent business; community based organizations etc.

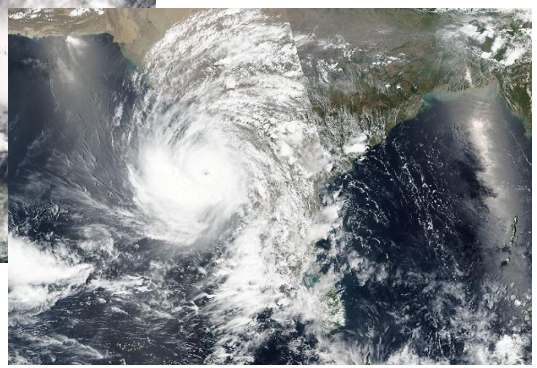
RISK IDENTIFICATION: OIL SPILLAGE IN KELANI RIVER

- Impacts by YAAS and TAKUKTAE cyclones (May / June 2021)
- Oil spill at Sapugaskanda due to flooding
- Droughts (2017 February)
- Construction site (2017 January)
- Discharge from Beverage industry (2015 August)

YAAS AND TAUKTAE CYCLONES IN MAY 2021

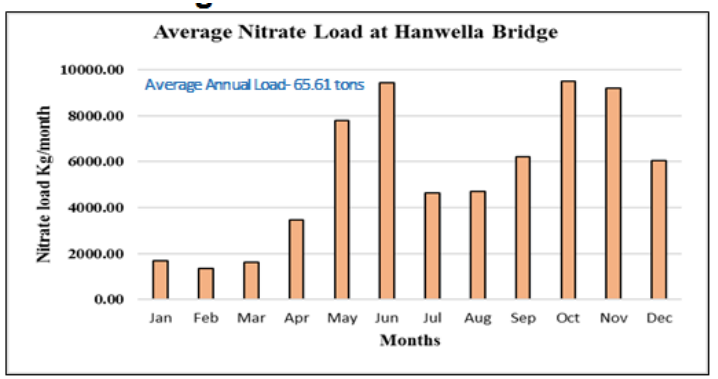
- Overflowing of the separator tanks containing furnace oil with the ingress of rainwater; 04th June 2021
- Inadequate supervision and operation of the slop oil being stored in pits of Sapugaskanda oil refinery
- Damages – 100 residents affected
  Mild to severe health conditions and breathing difficulties for children due to harsh smell and toxicity
- Providing booms and continues water quality monitoring to avoid contaminated water entering the WTP



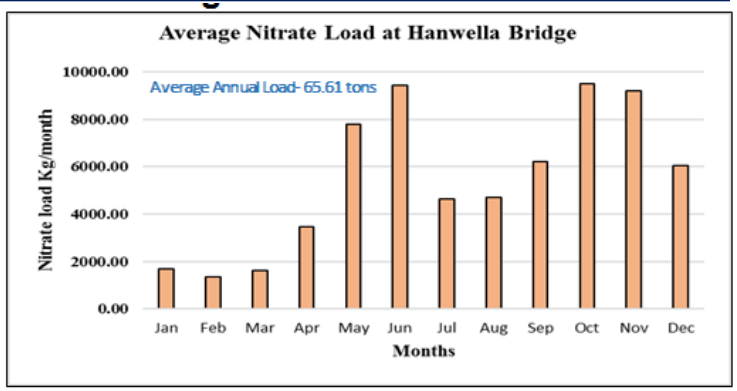


KELANI RIVER - FLOODS

- More frequent Floods
- Flows through highly urbanized areas; Colombo and Gampaha causing sever damages
- Water source for the NWSDBs largest water treatment facility at Ambatale providing water to Colombo City
- Higher turbidity levels in the River during floods cause difficulties in regular treatment processes
- Flooding cause severe damages to pipe systems and operations of the water intakes



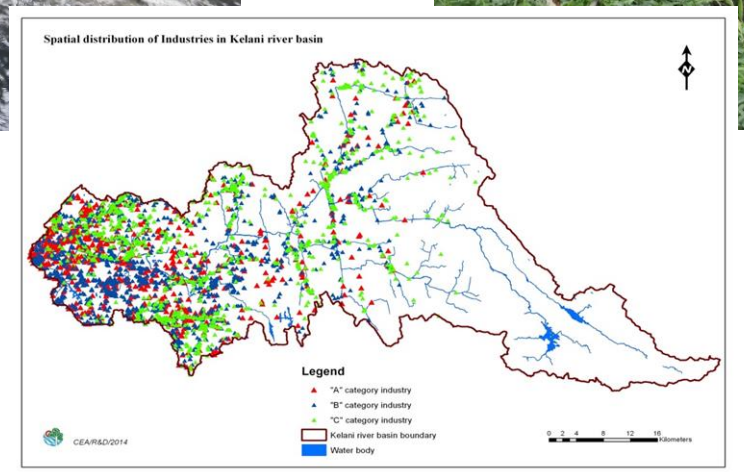
Kelani River Mullti-Stakeholder Partnership (KRMP)



Kelani River Mullti-Stakeholder Partnership (KRMP)

CADDIS FLY IN KELANI RIVER AT AMBATALE INTAKE

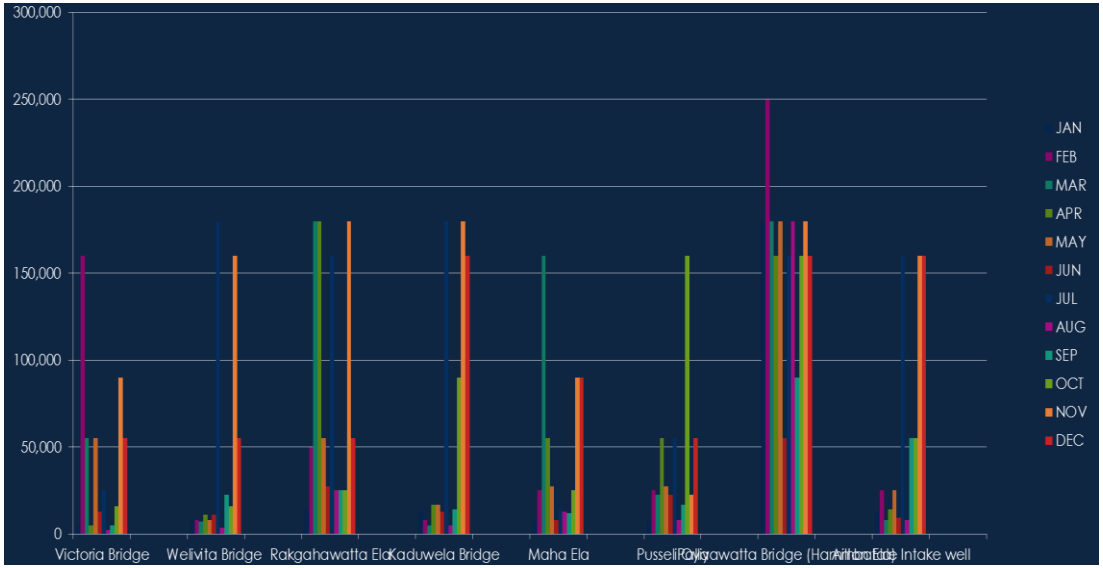
TOXIC WASTEWATER GENERATED FROM INDUSTRIES IN KRB



- Heavy metal contamination from industries.
- Organic compound contamination from industries.

MICROBIAL POLLUTION IN RAINY SEASON

- High turbid water contamination during rainy season
- Microbial contamination
- High levels ammonia in river water



FACILITATION OF ENVIRONMENT MANAGEMENT AT EXPORT PROCESSING ZONES (EPZS) IN THE KELANI BASIN

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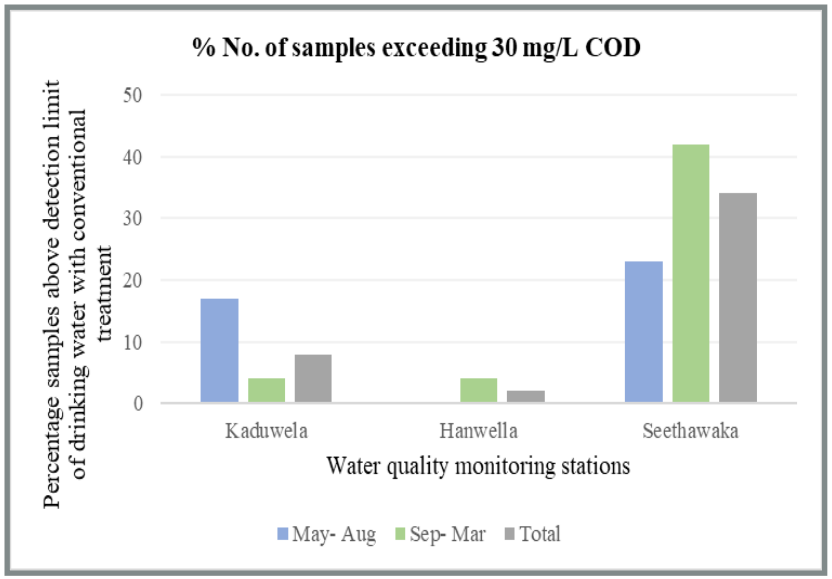
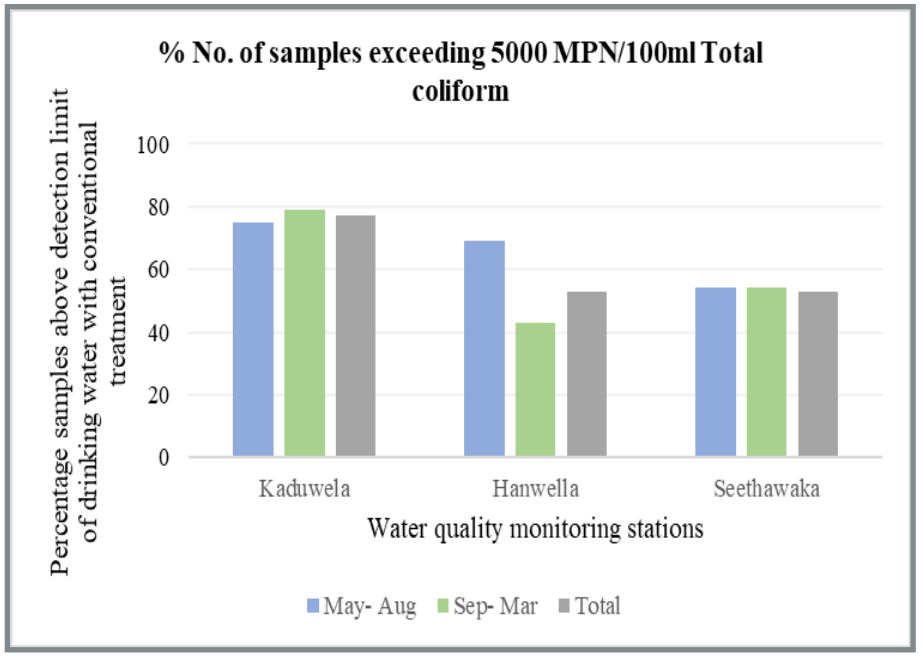
Identifying	Identifying potential improvements at Seethawaka and Biyagama EPZs
Strengthening	Strengthening the agency coordination and technical knowledge sharing while engaging BOI, CEA, NWSDB and others preparing for real time water quality monitoring
Integrating	Integrating WWTP improvements to overall Kelani River Basin management and conservation including support to source investments
Recognition	Developing success stories behind Effluent Water Treatment Plant to create awareness and Establishing a real time monitoring system to Seethawaka and Biyagamagama EPZs

KELANI RIVER WITH LOW FLOW

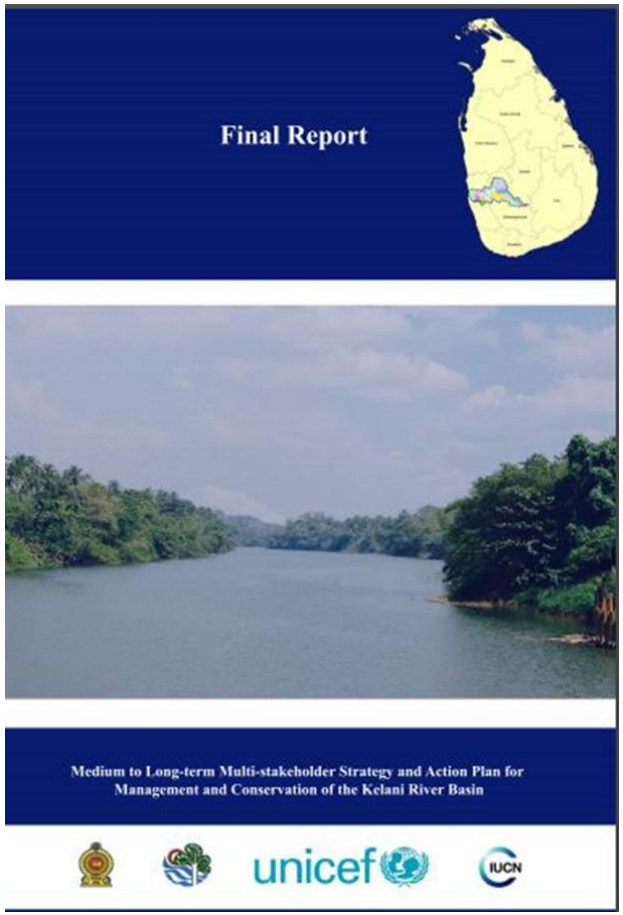
- RCl levels were dropped & high dose has been given but difficult to maintain the free residual levels. River flow is 4-6 m^3/S in these days and extraction is approximately 9.2 m^3/S. This is due to Sevier drought and minimum release from Laxapana hydro power station.
- Temporary suspend the dosing of Post lime
- Activate all the secondary chlorination points.
- Dosing of Sodium hypochlorite is started in Biyagama WW treatment plant out let.
- Instructions were issued by the BOI to control the discharges of ammonia from rubber industries.

INDUSTRIAL AND URBAN POLLUTIONS





KELANI RIVER MULTI-STAKEHOLDER PARTNERSHIP (KRMP) APPROACH



Vision

Balancing sustainable ecosystems and resilient livelihoods

Mission

Enabling environment for Govt. Agencies, Private Sector, Communities, Non-Govt. Entities, Universities, Media, International Agencies and others to work together towards a shared vision of a clean, green and safe Kelani River Basin

MANAGEMENT OBJECTIVES

Management Objective		Description
A		Land use management for source water protection and sustainability
B		Industrial and Urban Management for Pollution Control and Sustainability
C		Research, Studies, Awareness, Training and Education for Better Management and Conservation
D		Operationalizing, Monitoring and Evaluation of the Kelani River Basin Management and Conservation Plan
E		Public Private Partnerships contributing towards the sustainability of Kelani River Environment

THREE LEVEL PROGRAMMING OF KRMP

WATER QUALITY MONITORING AT STRATEGIC LOCATIONS WITH OPTIONS FOR REAL TIME MEASUREMENTS

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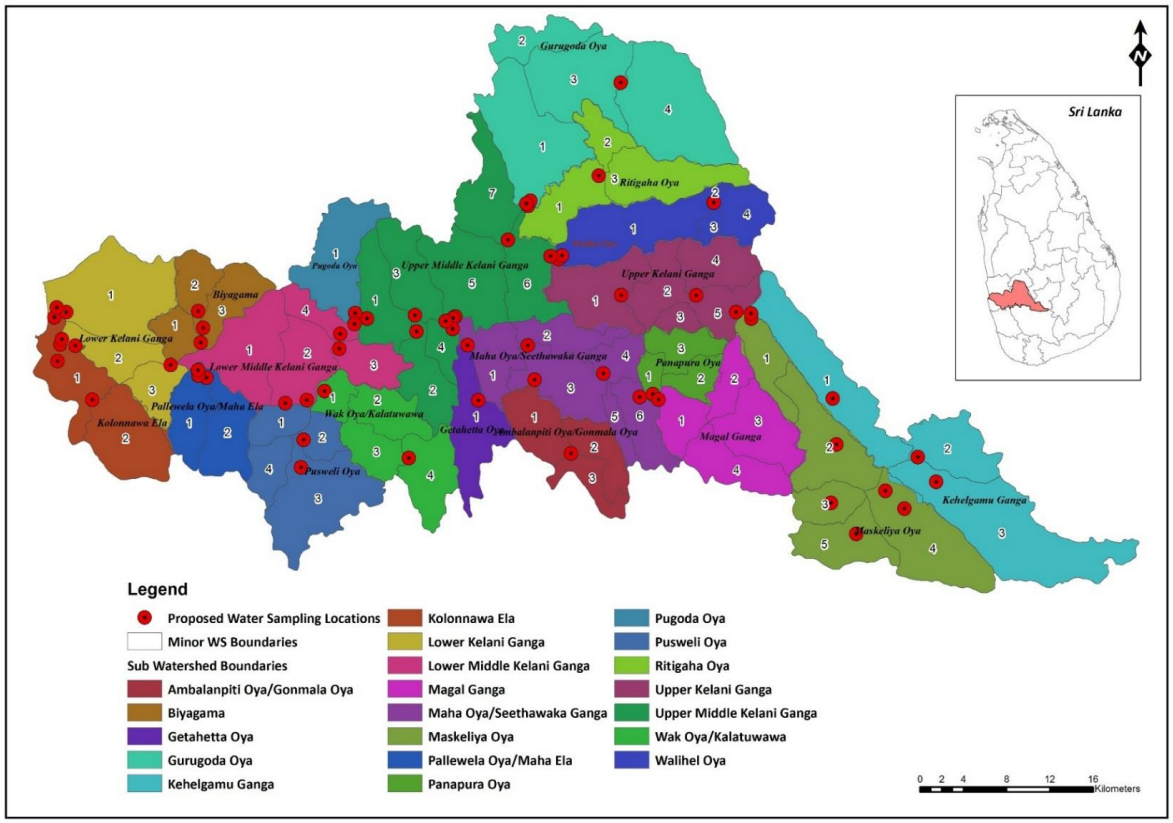
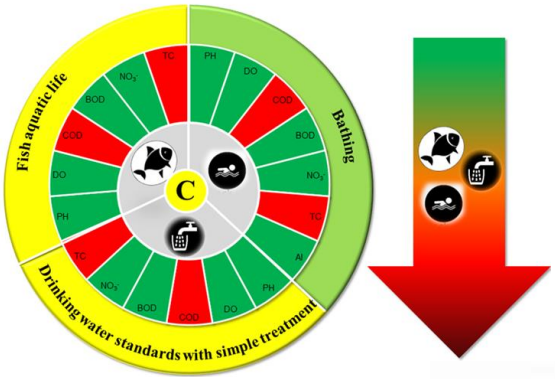
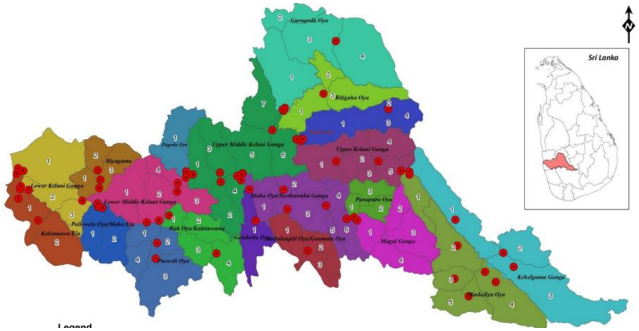


WATER QUALITY REPORTS





Nallathanniya
1233 m

Mausakelle Reservoir
1160 m

Norton bridge
876 m

Yatiyanthota
33 m

Kehelgamu Oya
226 m

Polpitiya
108 m

Bomiriya
12 m

Pugoda
18 m

Biyagama
8 m

Kelanithissa
6 m

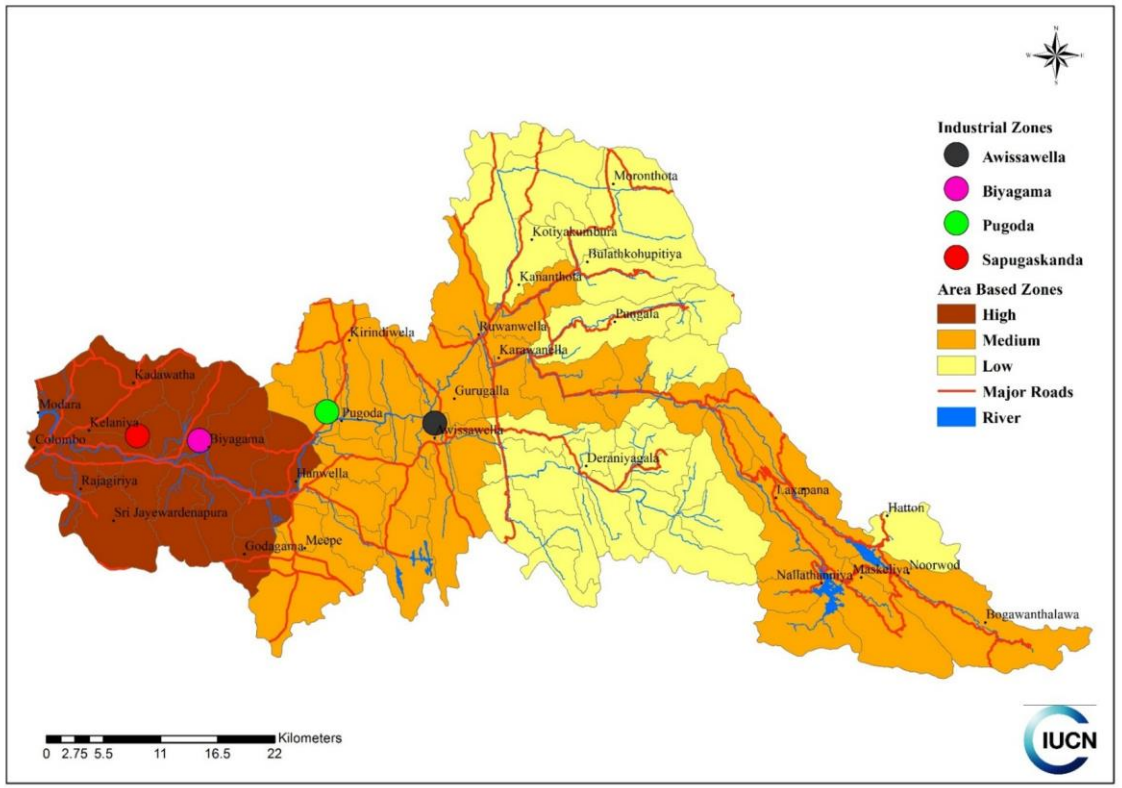
Agriculture and Sewage Lines TC, COD, NO_3^-

Industrial and Sewage Lines TC, BOD, COD, DO, Al, NO_3^-

MANAGEMENT PRIORITIES

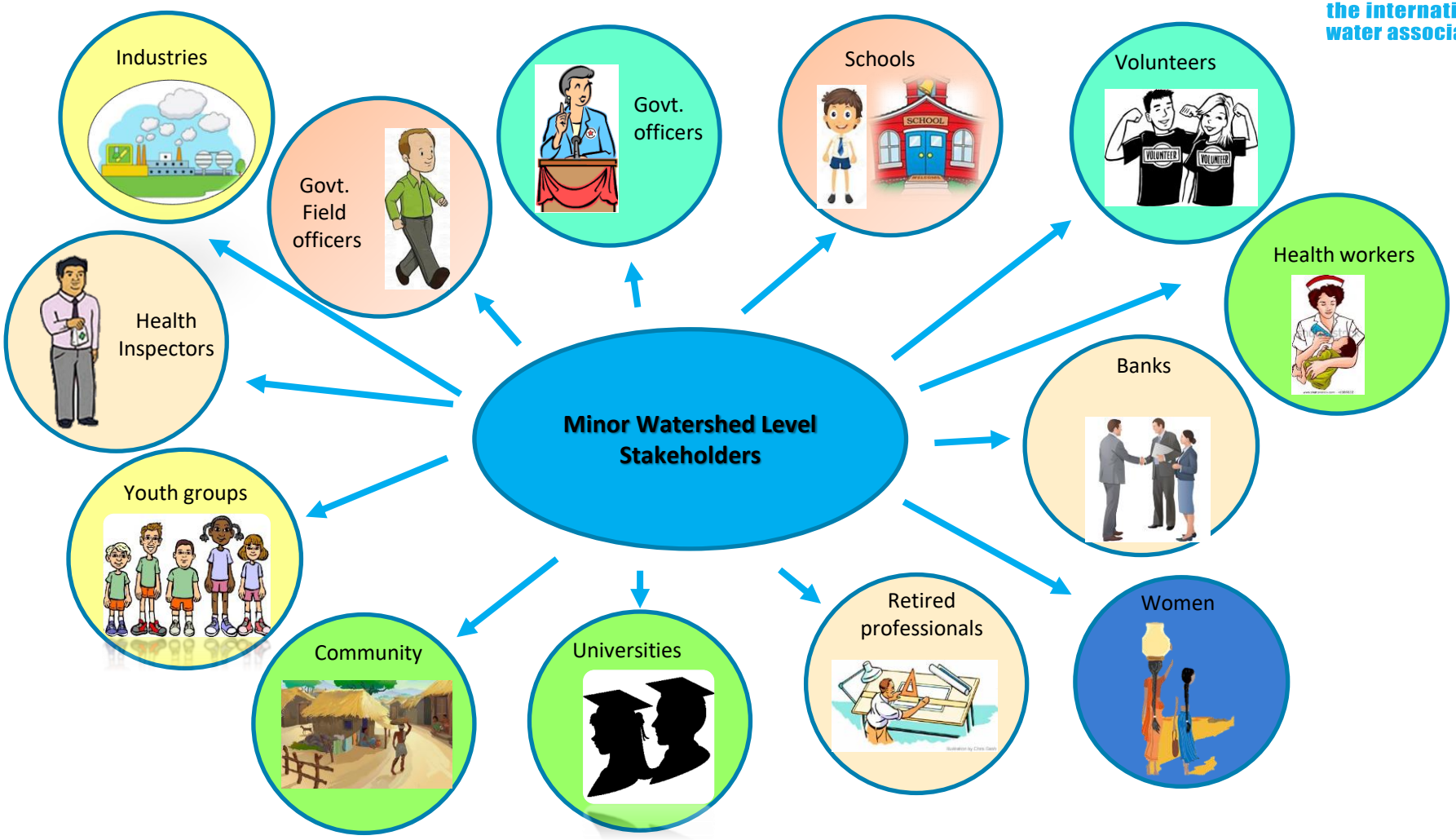
- Minor watershed clusters were prioritized using the water quality based report cards
  - Some areas may not need extensive programming
  - Number of areas need urgent attention

- BOI, NWSDB and CEA led waste water treatment improvements at BOI zones



MOBILIZATION AT COMMUNITY LEVEL – A UNIQUE MODEL

- Initial Government focus – Via District Administration
- Selection of a Govt. – NGO – Community mixed representation (eg: about 300 in each DS division
- Incorporation of area based industries and private entities including potential roles in the Public-Private-Community Partnerships
- Agreements on work plans and monitoring systems
- Additional funding support to ensure quality delivery


Industries
Govt. Field officers
Govt. officers
Schools
Volunteers
Health Inspectors
Health workers
Minor Watershed Level Stakeholders
Banks
Youth groups
Community
Universities
Retired professionals
Women

ILLUSTRATIVE ACTIONS FOR PRIVATE-PUBLIC-COMMUNITY PARTNERSHIPS

Best practices and technologies

- Education, Awareness and Advocacy
- Household waste (compost/ biogas, …)
- Medical, hazardous, Plastic, Electronic waste
- Recycling, reuse, waste exchange
- Waste water treatment
- Buffer strips and constructed wetlands
- Urban green spaces, nutrition, health education
- Water recycling and rain water harvesting
- Organic / Health Farming
- Nature tours and adventure tourism – new jobs
- Stream bank stabilization
- Student projects and university research
- Religious/cultural events related programming
- Youth camps, hands on activities, exchanges
- School competitions and hands on experiences
- Volunteer and sponsored activities
- Tree planting and upper watershed restoration
- Media engagement and rewards
- …. Keep adding

ADD TITLE

Seethawaka Divisional Secretariat
Volunteers- aroun 200+
Private Sector Participation- around 10

Dompe Divisional Secretariat
Volunteers- aroun 300+
Private Sector Participation- around 10

Homagama Divisional Secretariat
Volunteers- around 300+
Private Sector Participation- around 5

Waththala Divisional Secretariat
Volunteers- around 30+
Private Sector Participation- around 5

DIVERSE PUBLIC PRIVATE COMMUNITY PARTNERSHIP INITIATIVES LEADING TO SOCIAL ENTERPRISE MODELS, SUSTAINABILITY AND RESILIENCE

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- Biogas at different scales
- Plastics collection and recycling
- Prevent Dengue
- E-waste
- Waste to Agriculture (Composting)
- Adventure tourism
- Nature Trails
- Value added packaging
- Organic products
- Soil quality enhancements
- Minimizing land degradation
- Kelani Kids/Youth
- Glass recycling
- Contract farming with certifications
- Promoting research activities
- Healthy People-Healthy River
- Disaster preparedness
- Urban gardens with community benefits

KRMP BEST MANAGEMENT PRACTICES: MENUS' FOR DIFFERENT SECTORS

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Kids Menu

Waste Management

Waste Separation
Composting
Biogas generation
Waste free parties

Education and Awareness

Environment Diaries
Kids Facilitators

Healthy schools Healthy Kids

Organic Gardens
Medicinal Gardens

Fun to Go Green

Landscaping/beautifications
Fun with school nature trails
Eco Music

Household Menu

Fertilizer Management

Fertilizer free home gardens and lawns

Waste Management

Waste Separation, re-use, directing to recycle
Composting
Managing yards

Storm Water Management

Landscaping (Small scale bio filters, bio retentions)

Urban Menu

Storm Water Management

Urban Landscaping /Beautification (Bio retentions, Bio Filters)

Waste Management

Waste Collection Centers and recycling
Composting for urban beautification
Central Biogas facilities

Sustainable consumption practices

Urban Green Patches

THANK YOU.

the international water association

Water Safety Planning Process at Catchment Management Level: Lessons Learnt from South Africa

THABISA MANXODIDI, EMANTI MANAGEMENT, SOUTH AFRICA

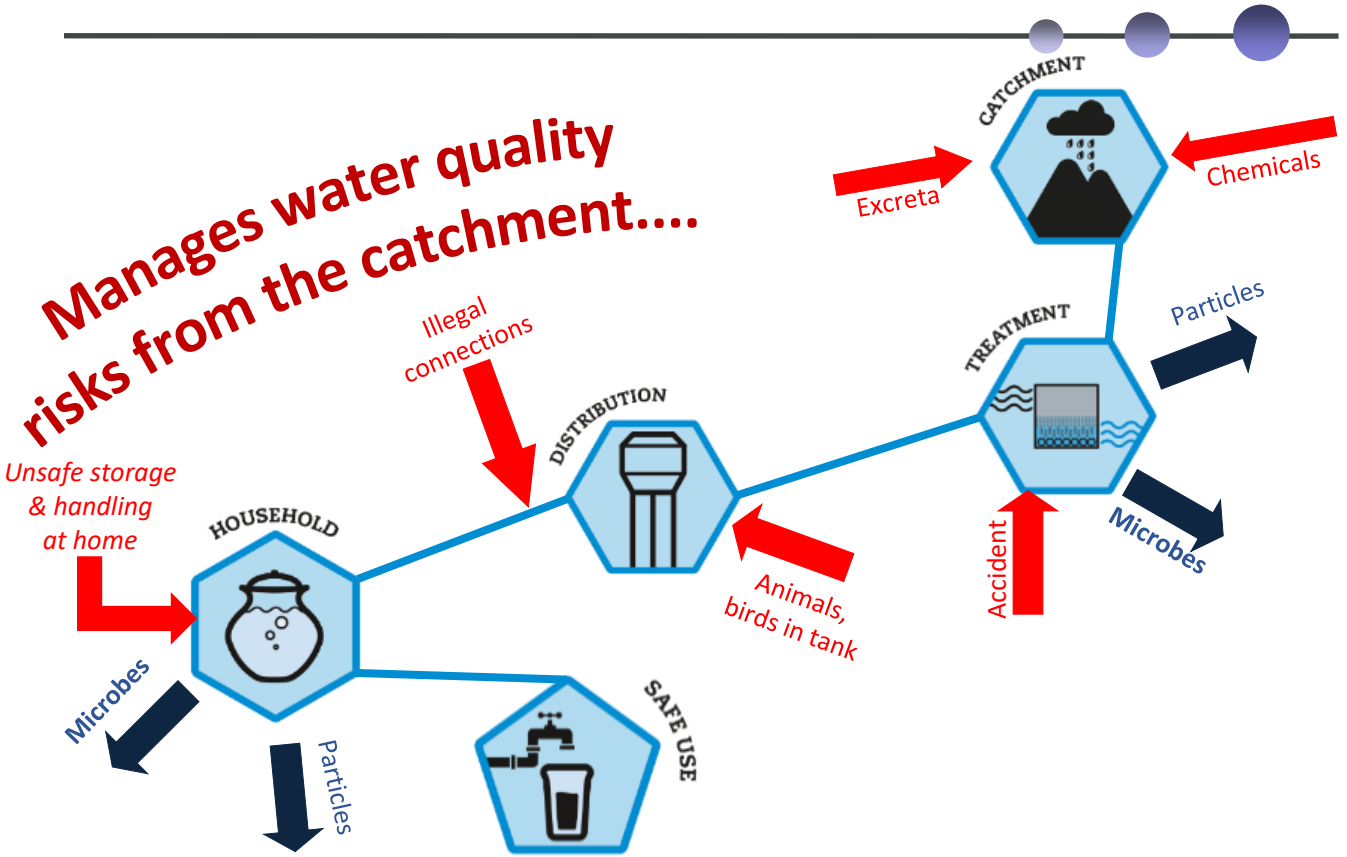
inspiring change

WHAT IS A WATER SAFETY PLAN (WSP)?

*A comprehensive **risk assessment & risk management** approach that includes **all steps** in the water supply*

"Most effective means of consistently ensuring the safety of drinking-water supply"[1]

WATER SAFETY PLANS

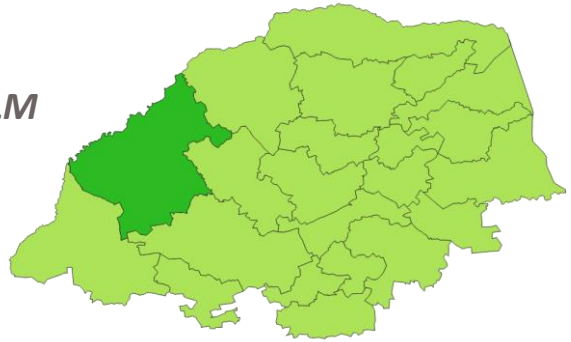


.... through to the consumer

3 PILOT CMAS/WMAS

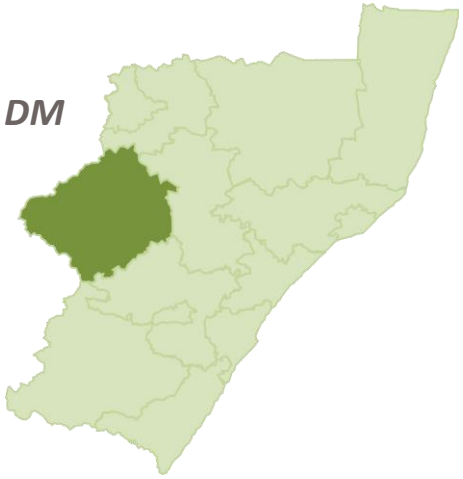
OUR PILOT MUNICIPALITIES

Lephalale LM (LP)



Witzenberg LM (WC)

Uthukela DM (KZN)



PROJECT OUTCOMES/IMPACTS (1)

1. Assists WSIs to assess how water system components may be affected by climate change.
2. Provide specific guidance (based on local conditions and circumstance) on how to incorporate climate change data into WSPs, resulting in improved risk management (hazard identification, prevention and mitigation of risks) and informed decision-making.
3. Improved capacity of technical and operational staff to improve the performance of WTWs.
4. Trained management staff who are able to improve municipal efficiency in climate change WSP related activities and develop actions to mitigate such.

PROJECT OUTCOMES/IMPACTS (2)

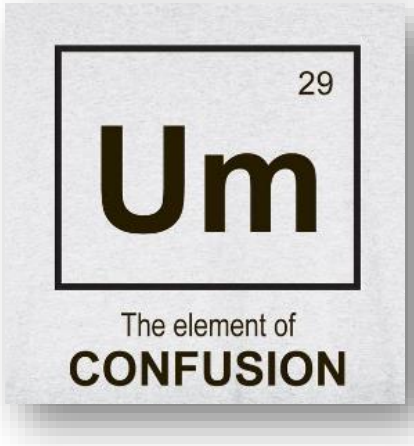
5. Improved capacity of technical staff to gather and analyze climate data and make decisions to increase efficient operation of their water and wastewater systems
6. WSIs, CMAs/WMAs and other stakeholders are working collaboratively to ensure outcomes are aligned
7. Improved awareness and functionality of relevant water partners on their role in driving solutions to local problems
8. Improved capacity and willingness of all partners to cooperate in order to achieve the set goals
9. Improved capacity of staff to have effective dialogues at catchment level regarding all issues relating to clean and sufficient water (strategic, operational, etc.), including trans boundary catchments

NEED FOR THE APPROACH?

- Overwhelming **YES!**
  - It is acknowledged that this has been ignored for some time, and engagements often only start when there is an emergency
  - Water use license can be used as a tool to drive improved inclusion of climate considerations

CHALLENGES WITH THE APPROACH AND METHODOLOGY?

- Not really!
  - Will be useful for municipalities, water boards and other water and sanitation sector stakeholders
- **BUT**
  - Require support from senior management to see the merit of including climate change impacts into planning considerations



HOW TO MOBILIZE SUPPORT FROM CMAS AND WMAS?

- CMAs/WMAs responsible for water resource management – poor WTWs performance will impact water resources → important to be involved in WSP
- Promote use of the methodology
- Consider amendment of Blue Drop criteria
- Promote improved planning and budget allocation to building climate resilience

HOW TO IMPROVE INFORMATION/DATA SHARING AND INTEGRATED PLANNING AT A CATCHMENT LEVEL?

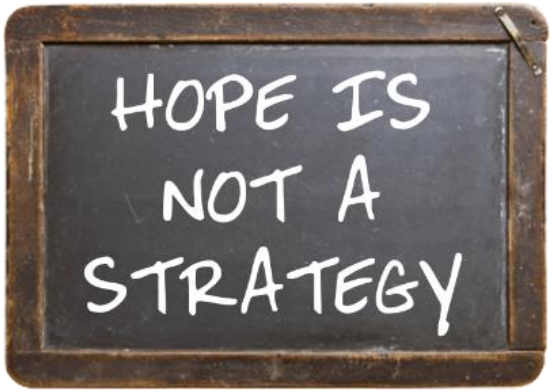
- Use existing forums/platforms
- Only effective if all participants contribute (e.g. identify challenges and what is being done/not done)
- Ensure provide value (e.g. raise awareness)
- Be involved in WSP
- Go out to sites and see what is happening on the ground

CMA/WMA NOTED CHALLENGES

- Do not have information regarding flood lines
- Uncontrolled activities at dams (e.g. sand mining)
- Illegal use, over-abstraction of groundwater, canal leakages
- Dams not filling up as expected; water unavailability → where is the water going?
- Lack of data/information sharing between transboundary countries (i.e. only high-level)
- Need for improved education on water resources
- Economic impacts (e.g. drought affected harvest)

PLANS TO DEAL WITH CLIMATE CHANGE IMPACTS?

- Disaster Management Plan
- Flood Management Plan
- Drought Management Plan
- Typical components
  - Team (e.g. Flood team, Joint Operating Committee)
  - Roles and responsibilities
  - Communication protocols
  - Response – know what to do

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Measures in place to support farmers amid drought

29 JUN 2020 SAVE | EMAIL | PRINT | PDF

Measures have been put in place to support farmers as a result of persisting drought conditions, Deputy President David Mabuza announced during the National Assembly on Tuesday, 23 June.

COMMON THEMES…LESSONS LEARNT

- Alignment
- Linking up
- Working closely with
- Collaborating
- Communicating
- Improved understanding of roles and responsibilities
- We are all in this together, and that to be successful, we need to work as a team
- To make an effective change, need support from all

COMMON THEMES…LESSONS LEARNT

- Basin authority officials are not usually involved in the development, implementation, assessment or auditing of a water safety plan
- No access to climate data/information, and
- Lack of understanding climate data/information and how to use it on a day-to-day basis.
- The basin authority officials should play a leading role with these advocacy and awareness efforts.

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Catchment and Source Water Management for Sydney, Australia

ANDREW BALL

inspiring change

SYDNEY'S DRINKING WATER CATCHMENT

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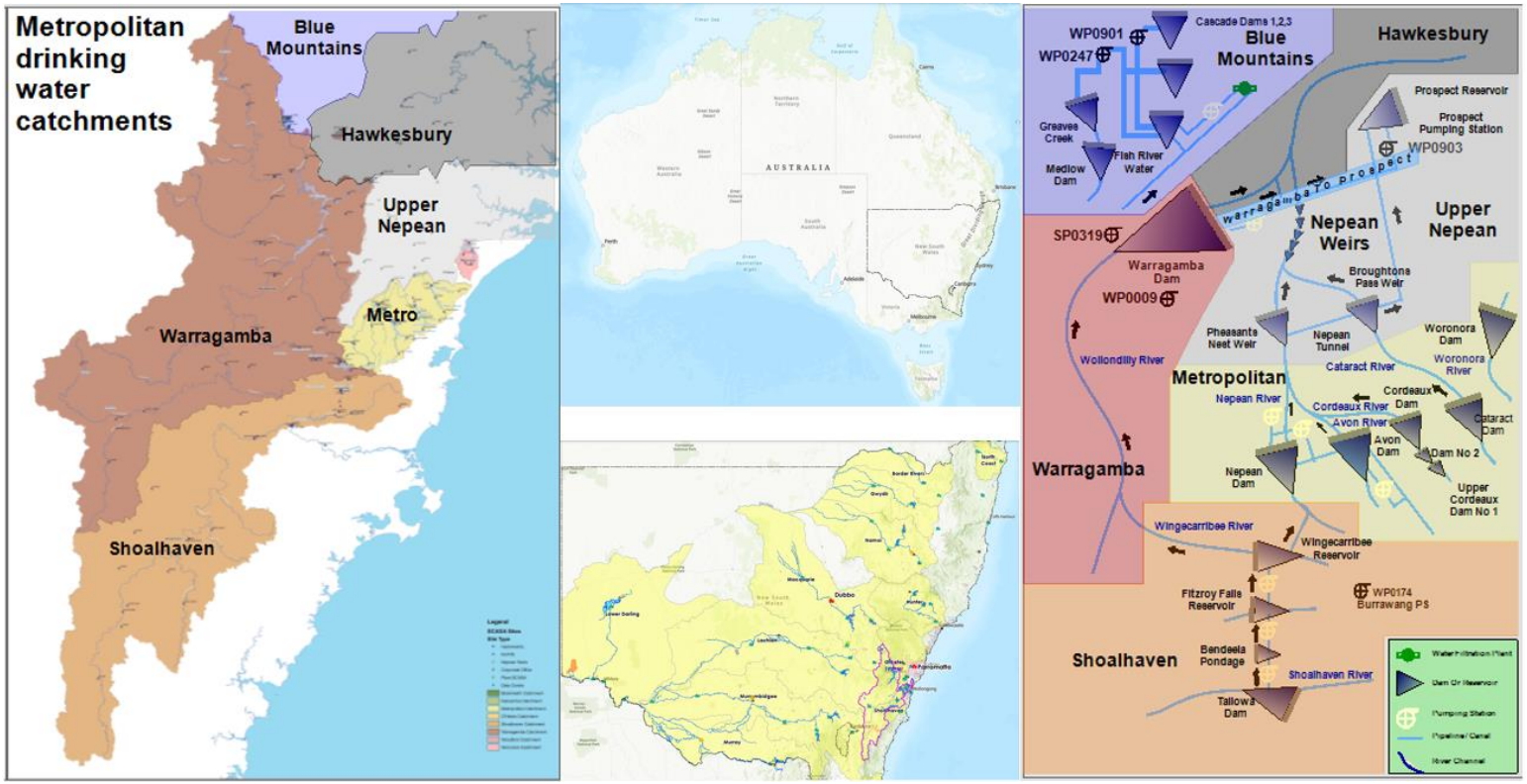
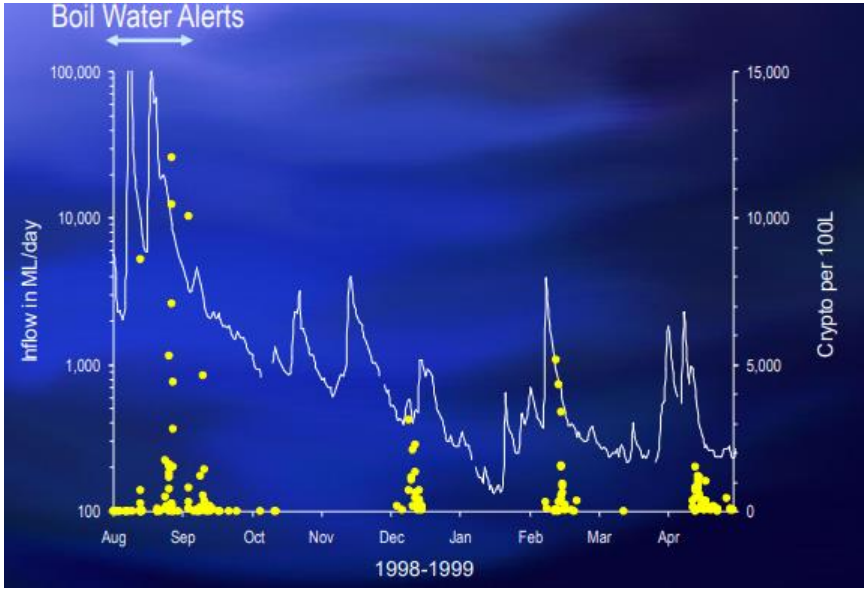


1998 SYDNEY *CRYPTOSPORIDIUM* INCIDENT



WQMS ELEMENTS

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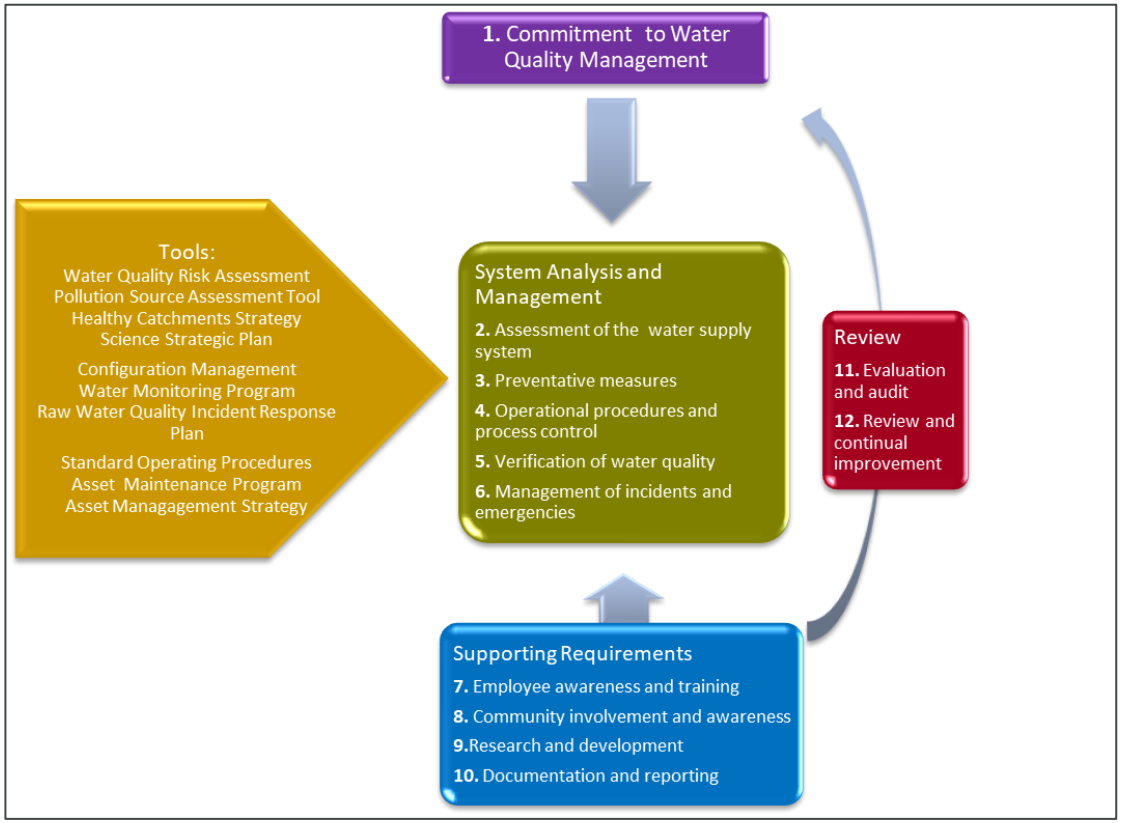
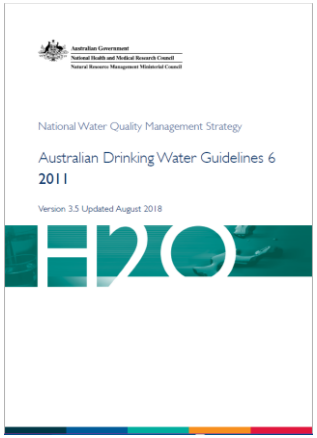


Australian Drinking Water Guidelines



Chapter 3 Framework for Management of Drinking Water Quality: the twelve elements

This chapter details the 12 elements that make up the Framework for Management of Drinking Water Quality (the Framework). Each element includes an introduction and a list of the components that make up that element, which are then described in further detail. A 'summary of actions' box heads each component, providing an overview of the steps involved in implementation.

Some elements of the Framework are more complex than others, and therefore require further explanation. The Appendix (located at the end of the Guidelines) provides additional information and guidance for two elements – *Assessment of the drinking water supply system* (element 2) and *Preventive measures for drinking water quality management* (element 3).

MULTI-BARRIER APPROACH

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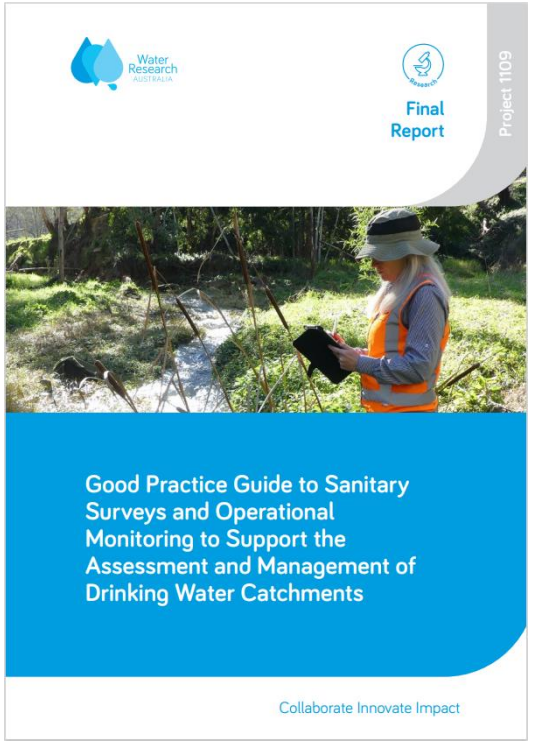
ADWG advocates managing water quality by identifying hazards and controls at each barrier within the water supply system from catchment to customer:

- **Catchment protection**
  - Identify land uses and pollutant sources and work with local government and landowners to mitigate risks to water quality
- **Storages**
  - Water quality advisors monitor inflows and in-lake processes and recommend actions to optimise raw water supplied for treatment (e.g. offtake levels)
  - In summer, surface water may be impacted by algae, in winter deeper water may be impacted by metals or elevated colour
- **Treatment**
  - Health related parameters may not be removed via conventional treatment processes and should meet ADWG in raw water supplied for treatment
  - Raw Water Supply Agreements list standards for parameters that may impact on treatment processes, such as metals, organics and physical parameters, these are generally not health related
  - Operational targets represent the customer's ideal water quality for treatment
  - WaterNSW treats water at Duckmaloi WFP for supply to Fish River

KNOWING WHAT HAZARDS ARE PRESENT IN THE CATCHMENT

Sanitary Survey – diffuse and point sources of hazards:

- of health concern (eg pathogens, pesticides, cyano-toxins)
- that promote cyanobacterial blooms (e.g. nutrients)
- of aesthetic concern (eg taste & odour)
- that challenge the treatment process (e.g. natural organic matter)



PSAT - MAPPING HAZARDS AND ASSESSING RISKS

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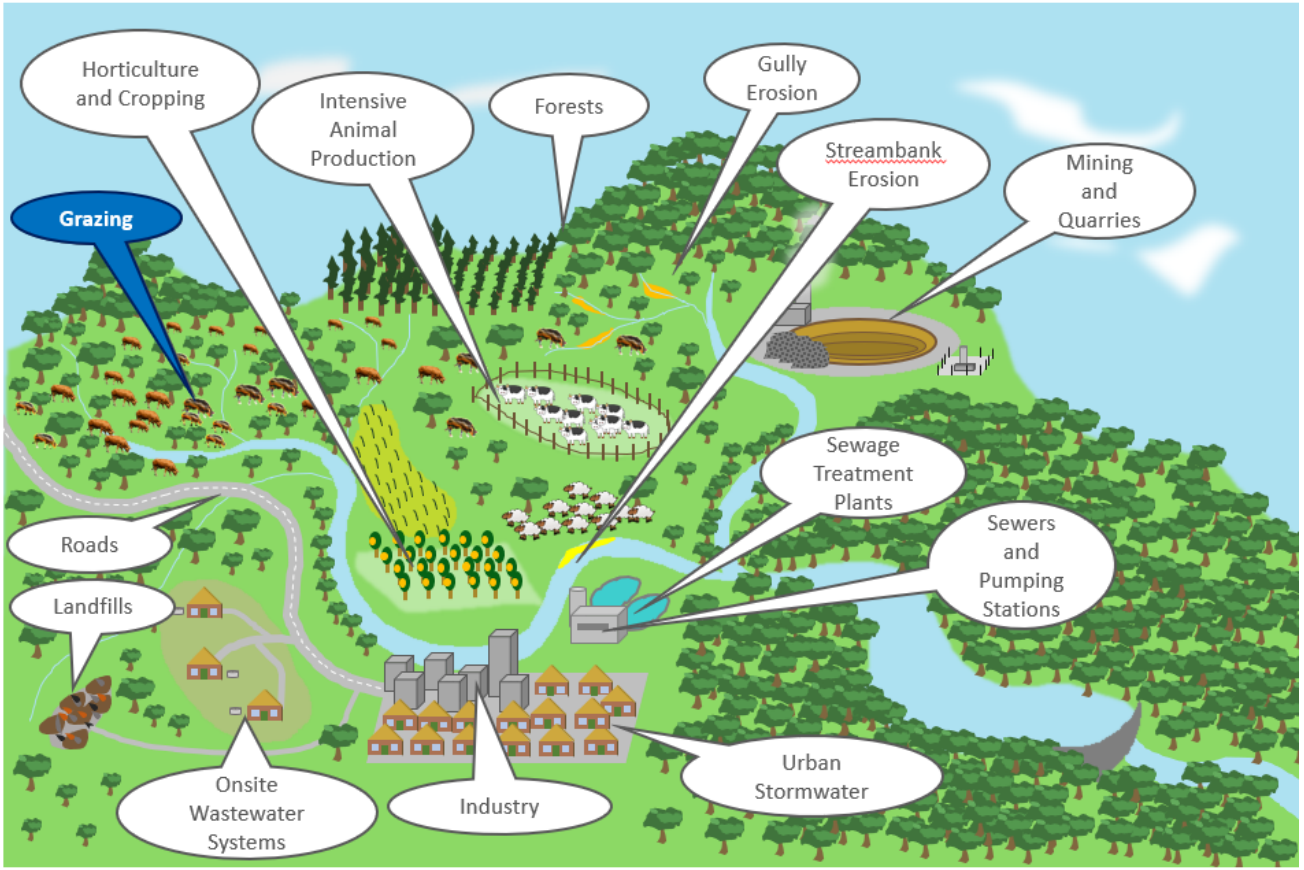
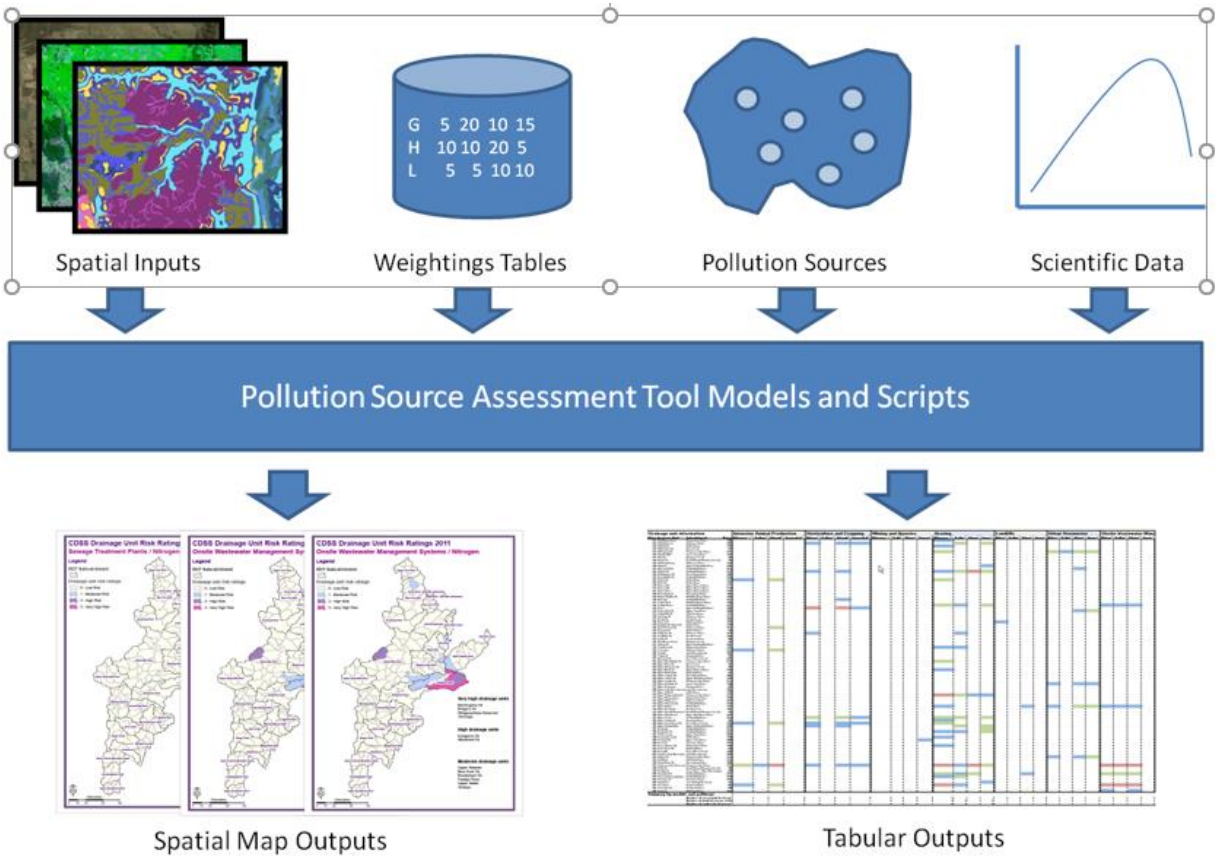
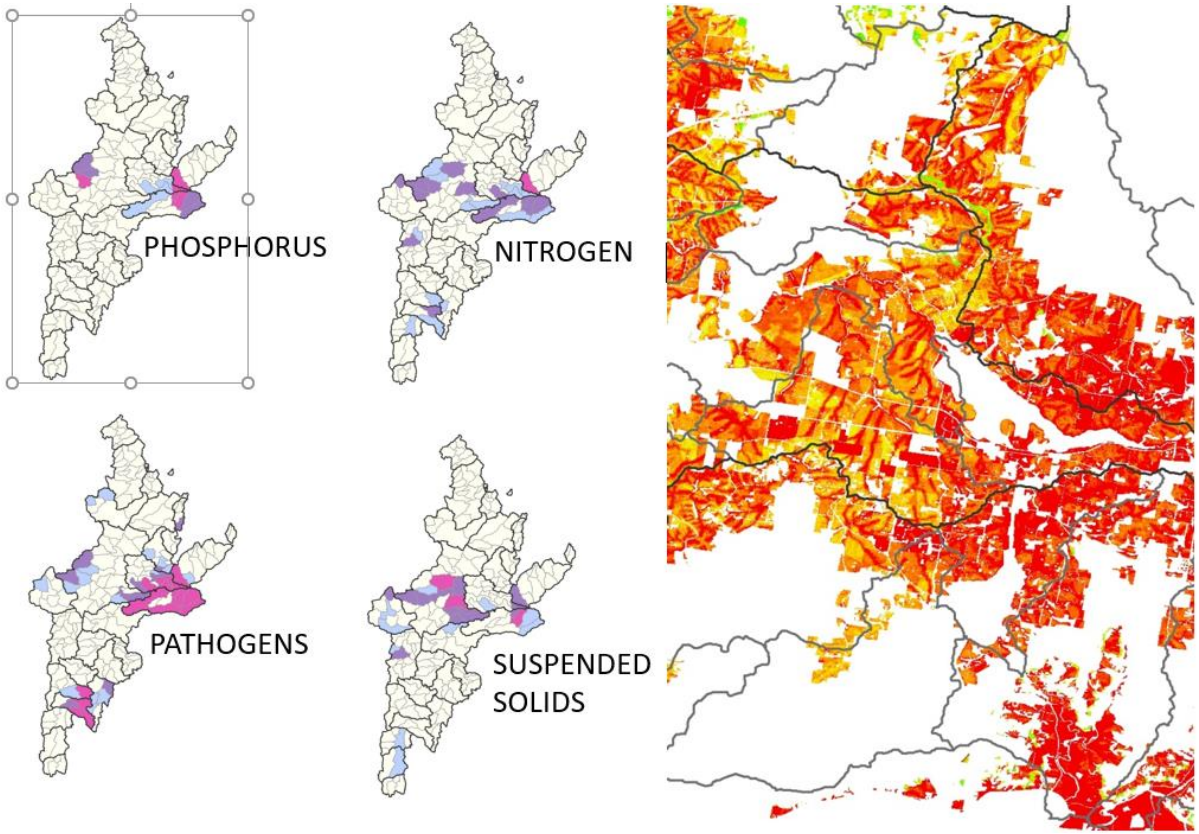


THE EVIDENCE BASE BEHIND PSAT



MAPPING RELATIVE RISKS



MANAGING POINT SOURCES

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Sewage Treatment Plants

- STP upgrades
- Notification of overflows and partial bypasses
- Monitoring program
- On-site sewage (septic tanks etc) inspections

Intensive animal production

- Dairy shed effluent ponds
- Calf rearing management

MANAGING DIFFUSE SOURCES

Legislative

- declared special areas and closed catchments

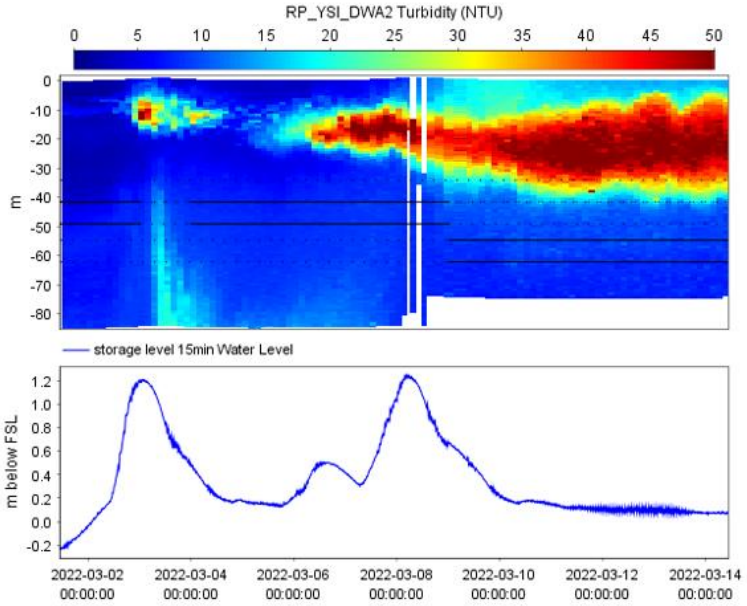
Working with stakeholders (councils, landowners)

- stormwater abatement
- riparian fencing/planting
- on-site sewage treatment – inspection and advice

Catchment/storage model development to support land management, water supply operations, risk assessment and strategic planning

MANAGING STORAGES

- Monitoring – routine and in events (catchment streams, inflows, storages, offtakes)
  - to identify sources
  - avoiding intrusions
  - long-term risk assessment/trend analysis
- Vertical profilers and SCADA
  - real-time water quality
- Avoiding intrusions of dirty water
  - selective offtakes / alternate sources



CATCHMENT-TO-CUSTOMER (C2C) RISK ASSESSMENT

SUPPLY	Hazard	Process	Hazardous event	Causes	Comments	Owner	Impact	Inh Conseq	Inh Likel	Inh Rating	Existing Controls (Catchment, storage, delivery)	Conseq at Supply	Likel at Supply	Rating at Supply	Existing Controls (Treatment, distribution)	Res Conseq	Res Likel	Res Rating	Uncertainty
Cascade	Cryptosporidium	01 Catchment	33a Inflow of water from catchment areas with high colour (NOM) results in NOM contamination of raw water supply which causes inability to meet turbidity limit when demand is high and therefore elevated Crypto risk	• Runoff event mobilises NOM from decaying leaf litter etc causes elevated NOM in inflow	May be higher in La Niña climate cycle	WaterNSW	**Customer Impacts** - Elevated NOM in raw water leads to loss of treatment capacity. **Compliance Impacts** - Elevated NOM in raw water leads to compliance breach for turbidity/THM exceedence in treated water. **Public Health Impacts** - Elevated NOM in raw water leads to elevated DBPs/Cryptosporidium in treated water causing public health issues.	Moderate	Likely	High 3	•1PR[1] Source selection/Alternative supply •3R[19] Water Quality Incident Response Protocol (incl. CRP)	Moderate	Unlikely	Medium 5	•1PR[5] 24/7 alarm monitoring & response •1P[28] WFP Filtration •2P[39] Maintenance & renewal programs •2PI[40] On-line WQ monitoring (chlorine/turbidity/pH/fluoride)	Minor	Unlikely	Low 6	Intermediate
Cascade	Viruses & Bacteria	01 Catchment	01a Significant rain or storm inflow event in the catchment results in viral &/or bacterial contamination of raw water supply	• STP, sewer & septic tank failure/overflow • Wash off of faecal material from native & feral animals & livestock areas • Contaminated urban stormwater runoff • Contamination from recreational areas		WaterNSW	**Public Health Impacts** - Presence of bacteria/viruses in drinking water to customers causes public health issues	Critical	Likely	Very High 1	•1PR[4] Pre-chlorination •1PR[5] 24/7 alarm monitoring & response •1P[6] Offtake level selection •1P[8] Mix/Shandy •3PR[19] Water quality incident response protocol	Major	Unlikely	Medium 4	•1PR[5] 24/7 alarm monitoring & response •1P[24] In-system re-chlorination •1P[28] WFP Filtration •1P[29] WFP primary disinfection •2P[37] Dual power supply •2PI[40] On-line WQ monitoring (chlorine/turbidity/pH/fluoride)	Minor	Very Unlikely	Low 6	Confident
Cascade	Cyano Toxins	02 Storage	Failure of aeration system results in poor quality raw water (cyanobacteria)	• Inadequate maintenance • Breakdown and slow repair • No spare parts carried		WaterNSW	**Public Health Impacts** - Presence of algal toxins in drinking water supplied to customers causes public health issues	Moderate	Possible	Medium 4	•2P[39] Maintenance & renewal programs •1P[6] Offtake level selection •1PR[5] 24/7 alarm monitoring & response •2P[11] Delivery management, source water & catchment inspections, fencing, public reporting etc) •2R[17] Standby dosing equipment •3PR[19] Water quality incident response protocol	Minor	Unlikely	Low 6	•1PR[5] 24/7 alarm monitoring & response •2R[8] 24 hour standby operations, production staff & maintenance crews •2R[10] Standby dosing equipment •1P[23] Maintain turbidity <0.1 NTU at WFP •1P[24] In-system re-chlorination •1P[28] WFP Filtration •1P[29] WFP primary disinfection •2P[37] Dual power supply •2P[39] Maintenance & renewal programs •2PI[40] On-line WQ monitoring (chlorine/turbidity/pH/fluoride) •2P[43] pH buffering	Minimal	Unlikely	Low 6	Uncertain
Illawarra	Viruses & Bacteria	01 Catchment	01a Significant rain or storm inflow event in the catchment results in viral &/or bacterial contamination of raw water supply	• Wash off of faecal material from native & feral animals & livestock areas		WaterNSW	**Public Health Impacts** - Presence of bacteria/viruses in drinking water to customers causes public health issues	Critical	Likely	Very High 1	•1PR[4] Pre-chlorination •1PR[5] 24/7 alarm monitoring & response •1P[6] Offtake level selection •2R[17] Standby dosing equipment •3PR[19] Water quality incident response protocol	Major	Possible	High 3	•1PR[5] 24/7 alarm monitoring & response •2R[8] 24 hour standby operations, production staff & maintenance crews •2R[10] Standby dosing equipment •1P[23] Maintain turbidity <0.1 NTU at WFP •1P[24] In-system re-chlorination •1P[28] WFP Filtration •1P[29] WFP primary disinfection •2P[35] Backwash water management (control of supernatant return) •2P[37] Dual power supply •2P[39] Maintenance & renewal programs •2PI[40] On-line WQ monitoring (chlorine/turbidity/pH/fluoride)	Minor	Possible	Medium 5	Confident

CHALLENGES

- Increasing population and urbanisation
  - including pressure for recreational access
- Increasing extreme events – bushfires, floods
  - increasing NOM – filtration and DBPs
  - more frequent cyanobacterial blooms
- Emerging hazards (PFAS, micro-plastics, BMAA?)
- Quantifying the benefits of catchment management (optimise investment)

WATERNSW SOURCE WATER PROTECTION STRATEGY

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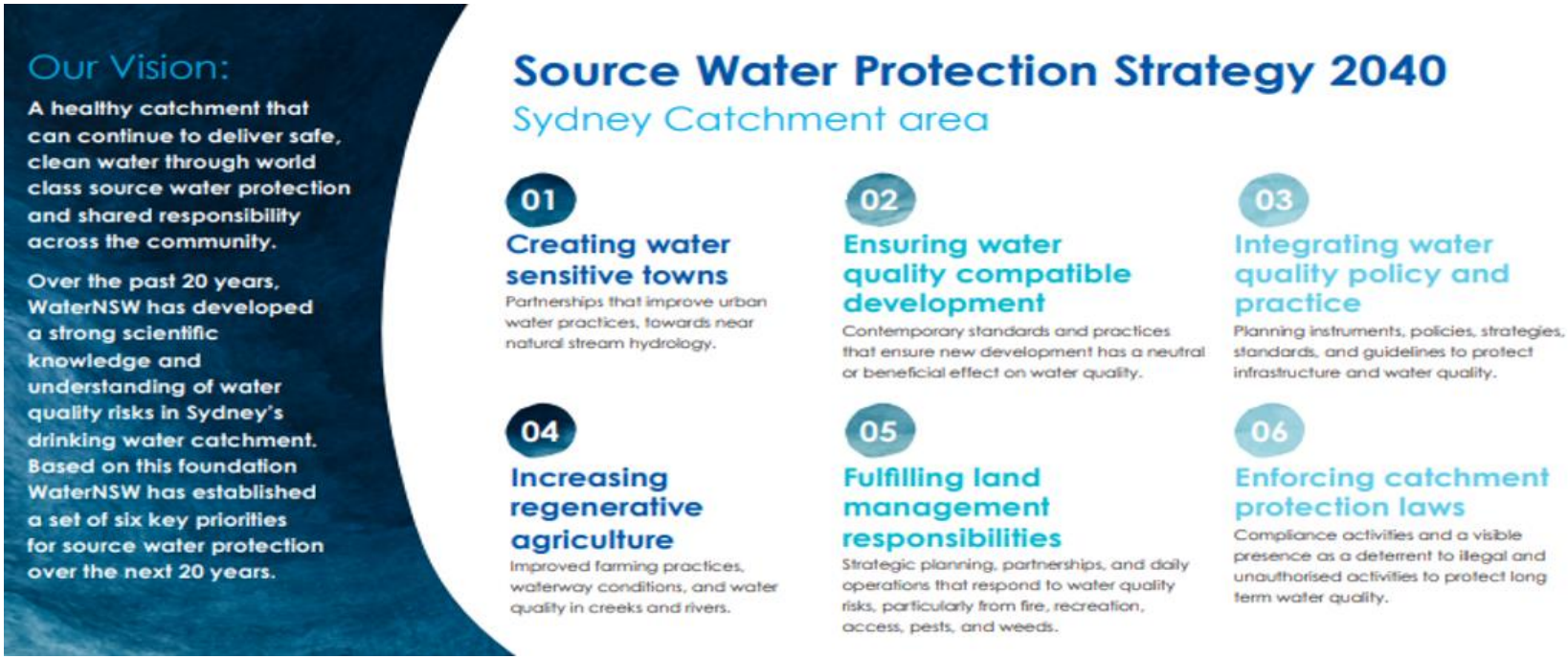

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Q&A Discussion

MODERATOR: PHILIP DE SOUZA

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