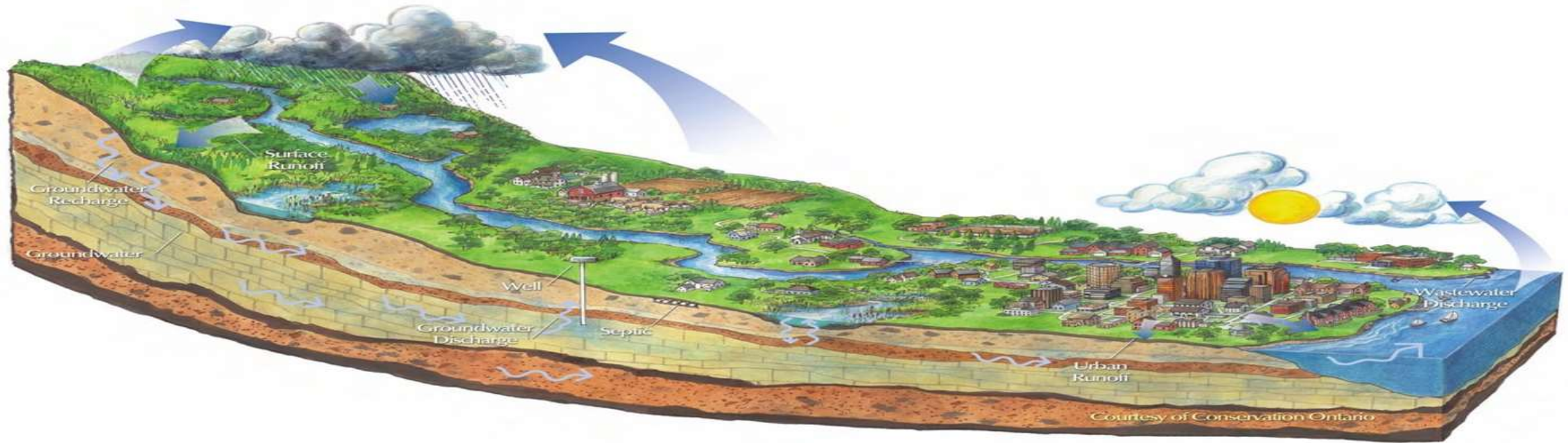


Water Balance and Allocation Modeling in Rwanda



By Alsaad NDAYIZEYE
& Nicole TWAGIRA



Water Evaluation And Planning System

- WEAP is a software tool for integrated water resources planning
- It is a tools for decision making
- It provides a comprehensive, flexible and user-friendly framework for policy analysis.

Catchments with Water Allocation Models



20 10 0 20 Kilometers



Baseline, Projections and Alternatives

- **Baseline.**
- The WEAP model was used to set the Baseline that is used to compare with future Projections and Alternatives. This Baseline can be considered as the current situation and was analyzed by using data and information from a ten years period (2006-2015).
- **Projections**
- Projections (sometimes referred to as pathways or storylines) are future scenarios that can be hardly influenced by water planners and decision makers. Four different types of Projections were analyzed: climate change, population growth, and macro-economic development. For each of these three Projections a total of three time-horizons were considered (2024, 2030 and 2050) as well as a low, medium and high impact projection.

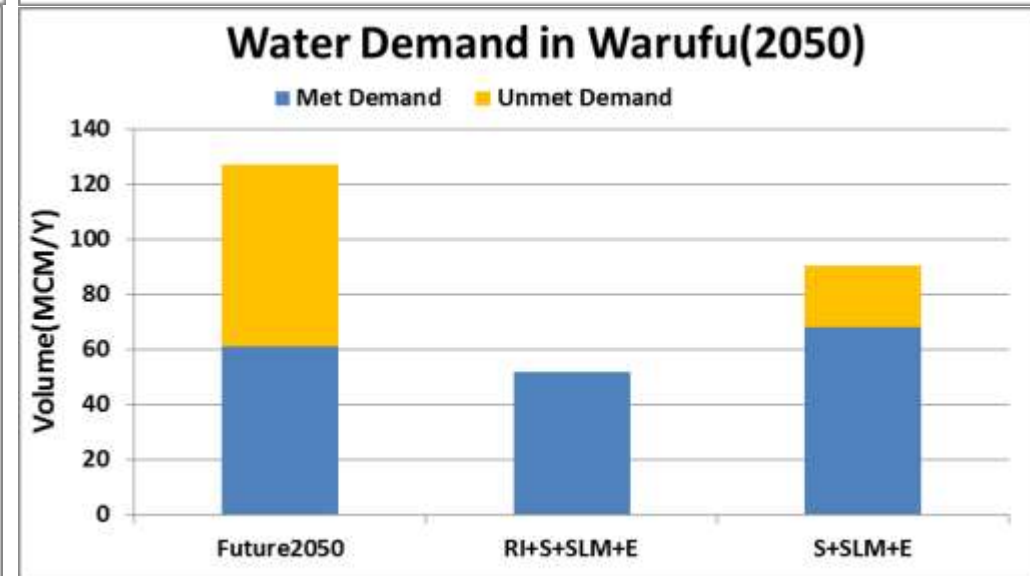
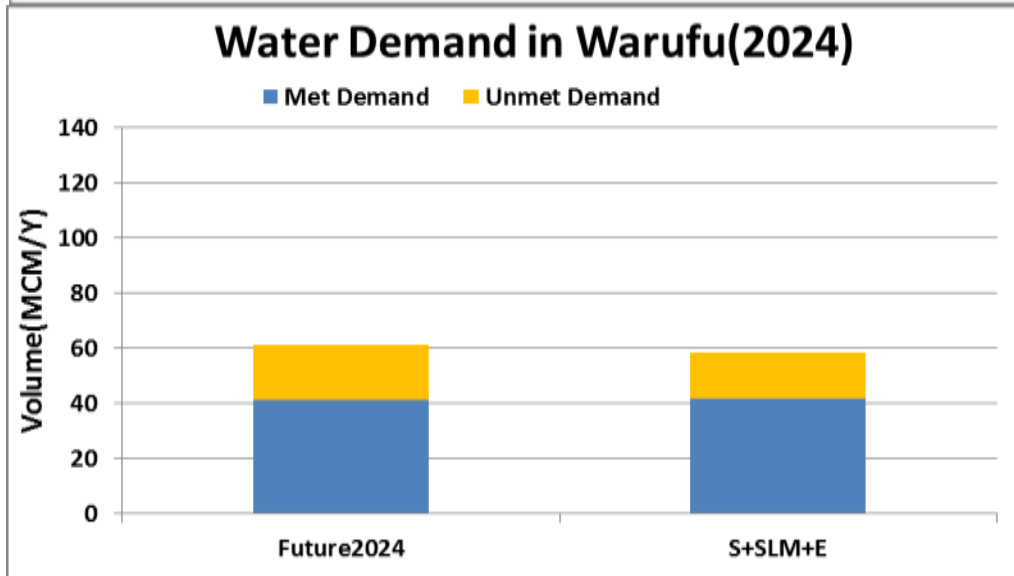
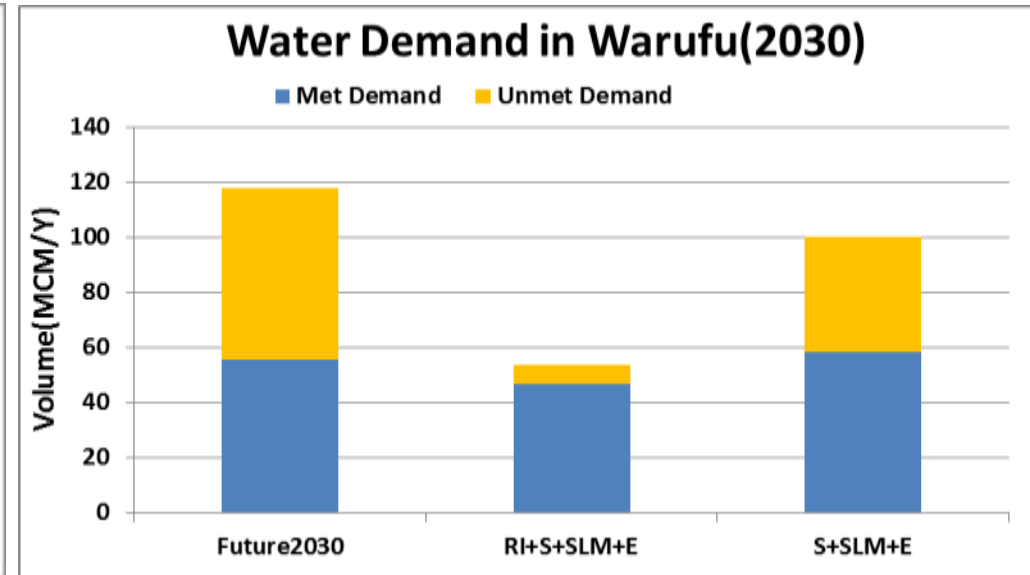
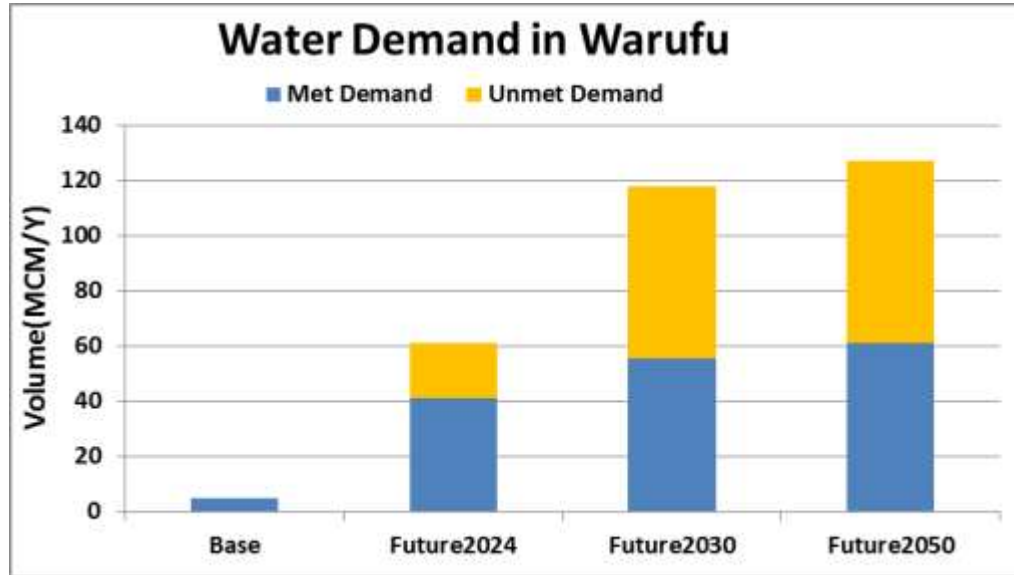
Alternatives

- In contrast to the Projections as described above are the so-called Alternatives. Alternatives (sometimes referred to as interventions, adaptations, or implementation scenarios) are decisions initiated by policymakers and implemented by water managers that will optimize water resources management. Examples are constructing reservoirs, training farmers, irrigation planning, erosion control, watershed conservation, amongst many others.
- The Alternatives (interventions) are evaluated for different options for each three time horizons.

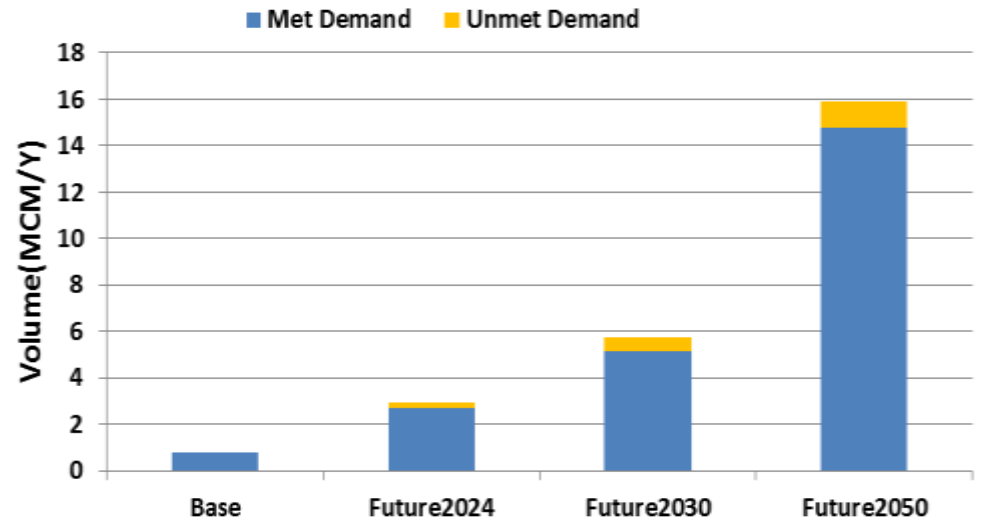
| Alternatives | Potential Storage per capita (m3/cap) | Irrigation (IMP implementation) (%) | Irrigation water use efficiency (%) | Domestic water use efficiency (%) | Industry water use efficiency (%) |
|--|---|---------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|
| 1. Autonomous development (Future medium) | 2024: current 2030: current 2050: current | 2024: 50% 2030: 100% 2050: 100% | BAU | BAU | BAU |
| 2. Water storage increase (S) | 2024: current 2030: (50%) 2050: (100% of RWRMP) | As (1) | BAU | BAU | BAU |
| 3. Water storage increase + increase in water use efficiency (S+E) | As (2) | As (1) | 2024: 5% 2030: 15% 2050: 30% | 2024: 10% 2030: 15% 2050: 20% | 2024: 5% 2030: 10% 2050: 20% |
| 4. Reduced Irrigation + water storage increase and water use efficiency increase (RI+S+E) | As (3) | 5024: 50% 2030: 50% 2050: 50% | As (3) | As (3) | As (3) |

MUVUMBA CATCHMENT

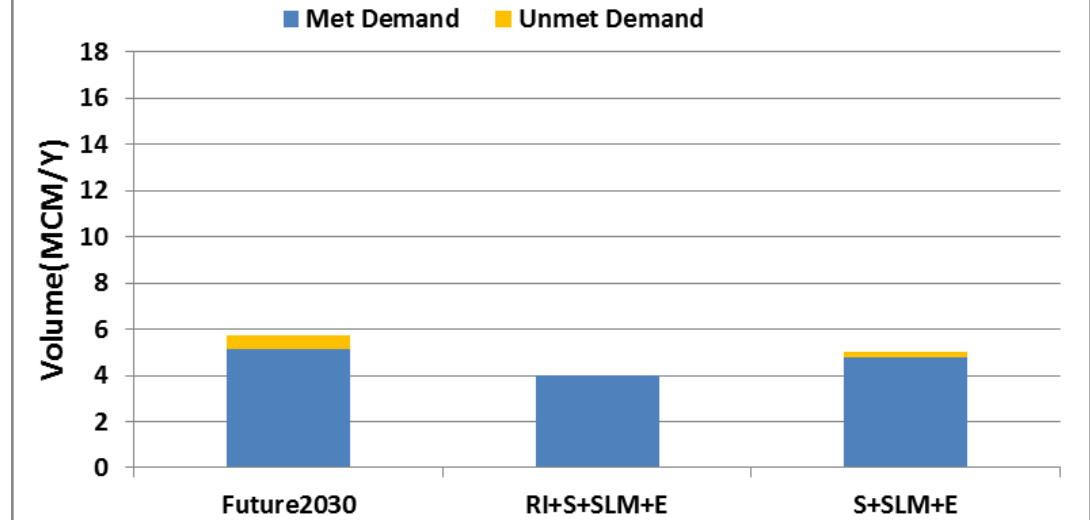
(eg: Warufu and Mulindi subcatchments)



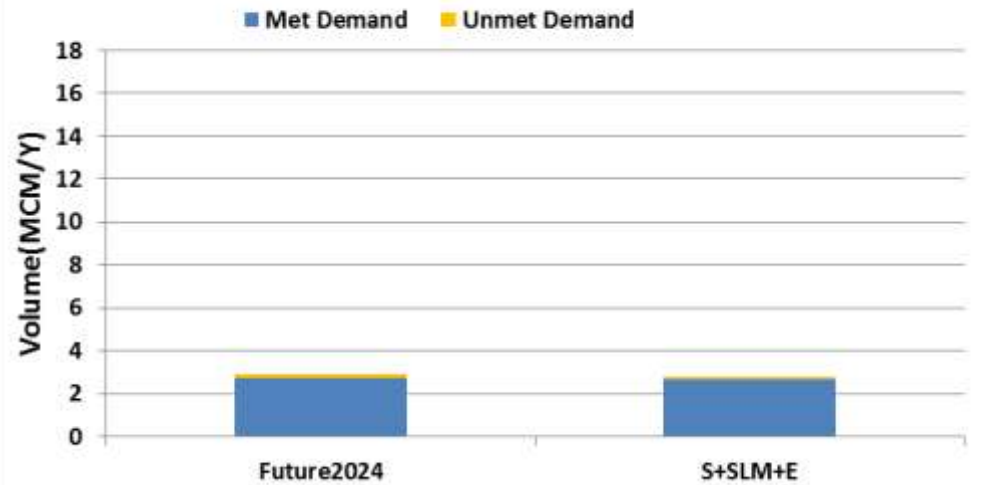
Water Demand in Mulindi



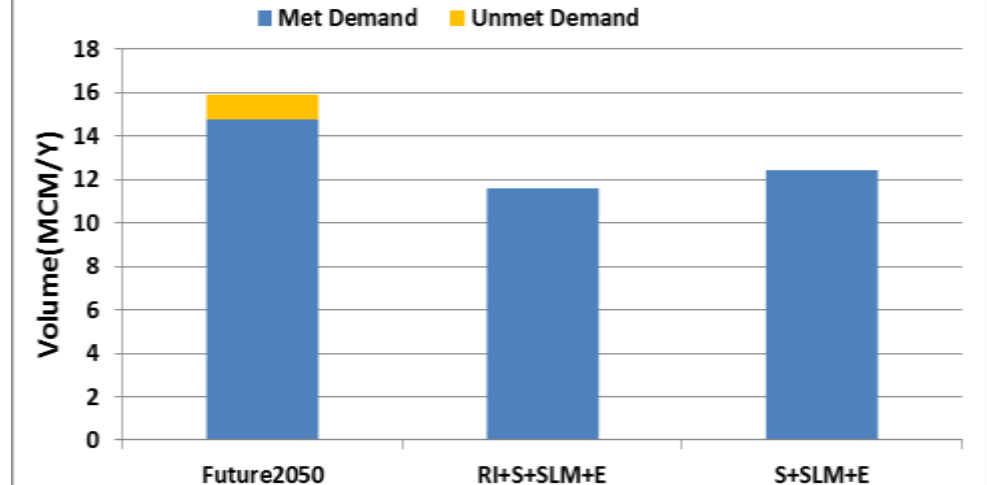
Water Demand in Mulindi(2030)



Water Demand in Mulindi(2024)



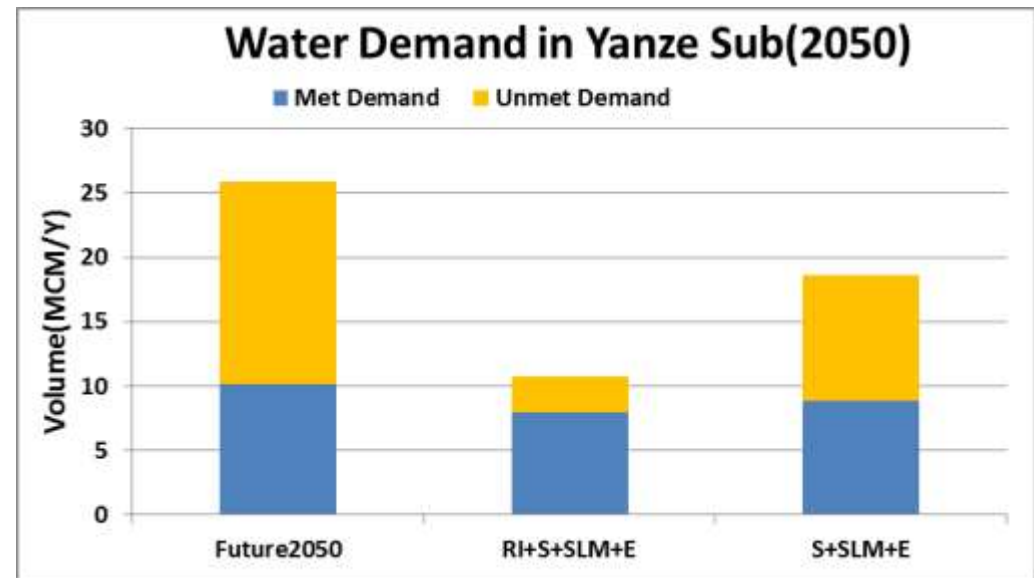
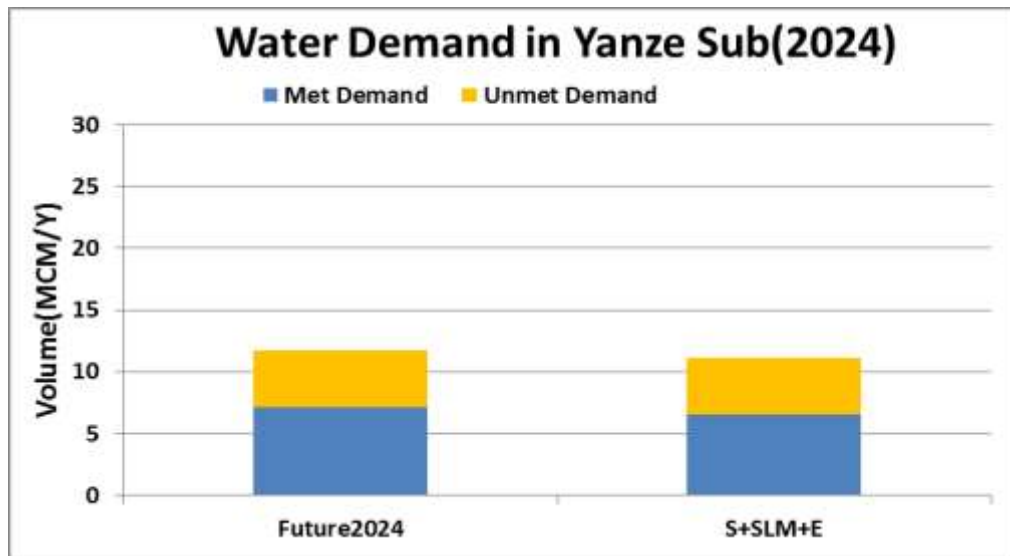
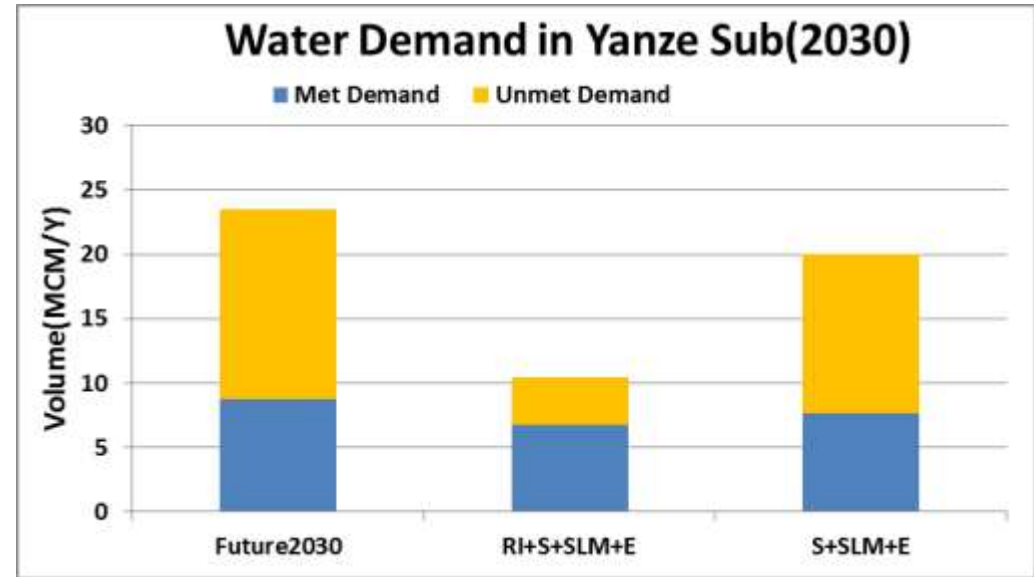
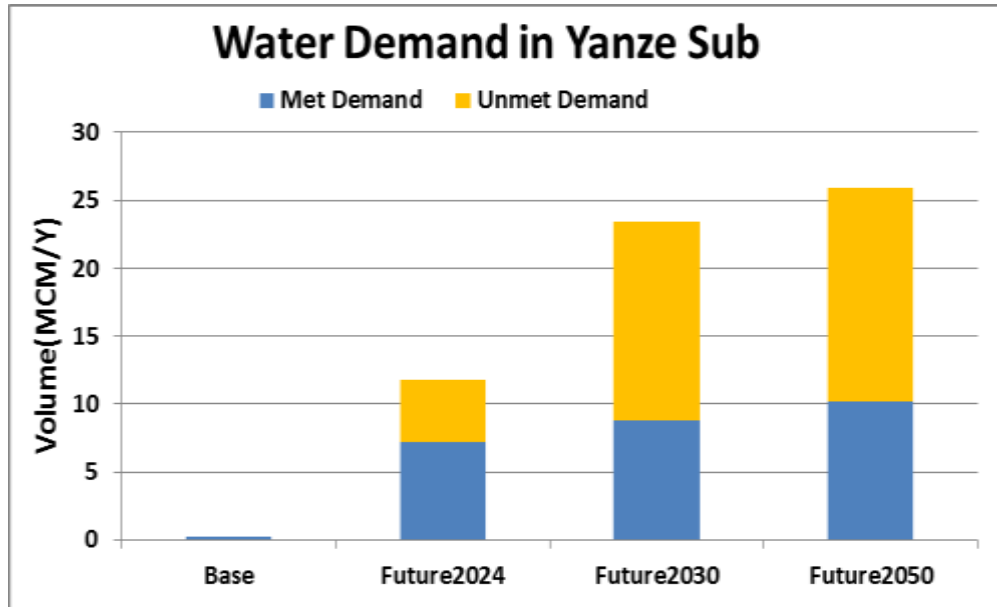
Water Demand in Mulindi(2050)



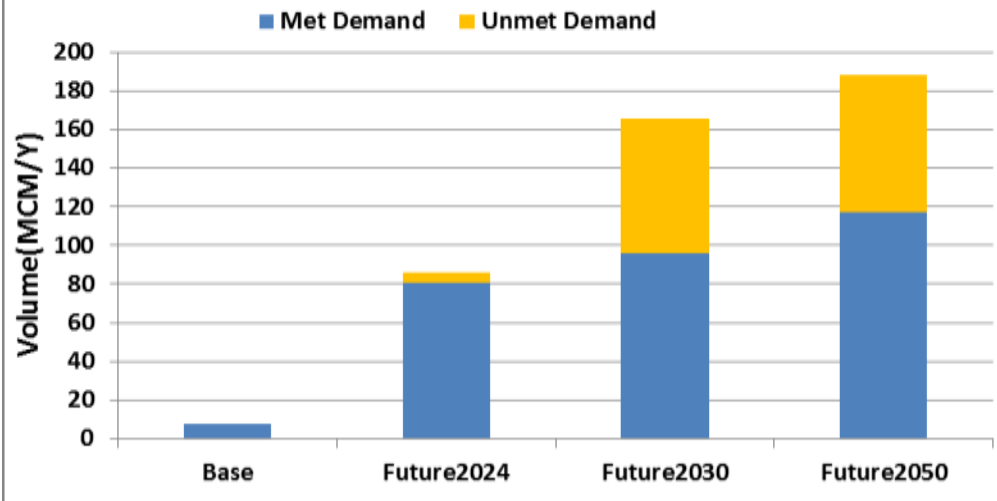
- **Note that;**
- In several sub-catchments, unmet demand reduces towards 2050, thanks to higher water use efficiencies and increased water storage.
- Irrigation development in all sub-catchments needs to go hand in hand with storage development and efficiency improvements.
- Speeding up development of storage and efficiency improvement, helps to avoid unmet water demand in 2024, 2030.
- Only 2 out of 5 subcatchments; Warufu and Ngoma require reduced irrigation (50%) development in Muvumba, the others can develop up to 100% of the IMP targets.

NYABUGOGO CATCHMENT

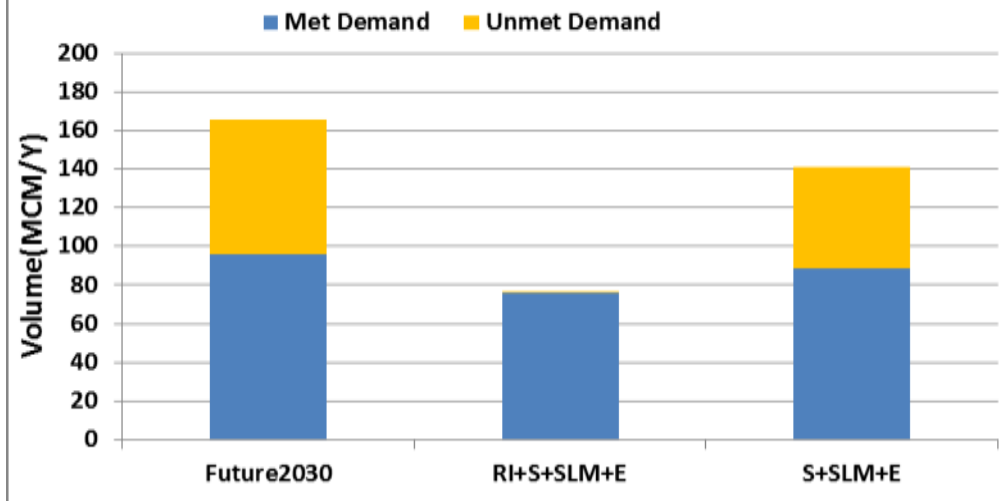
eg; Yanze, Muhazi and Nyacyonga-Rufigiza subcatchments



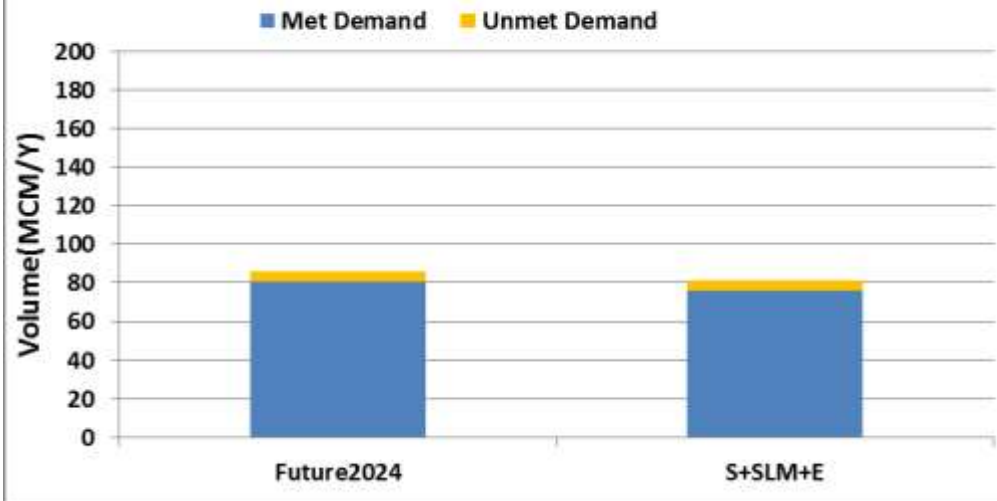
Water Demand in Muhazi Sub



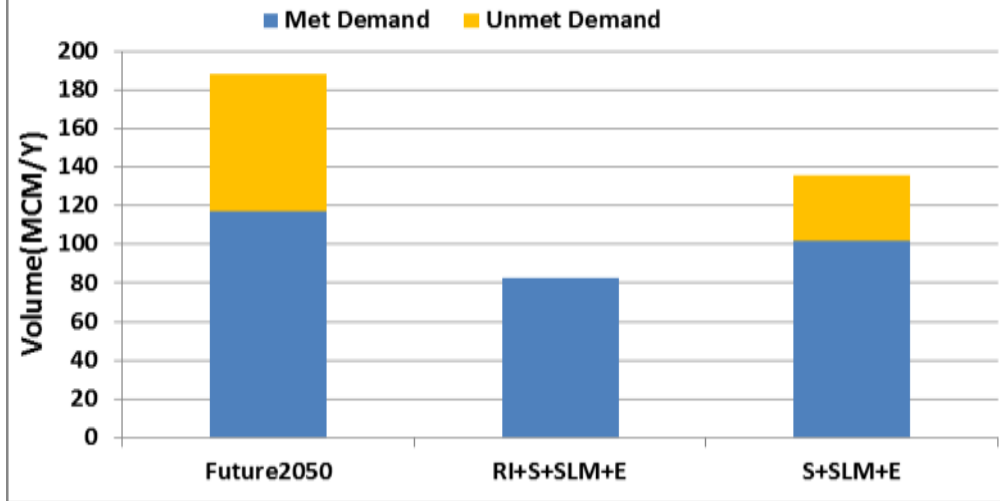
Water Demand in Muhazi Sub(2030)

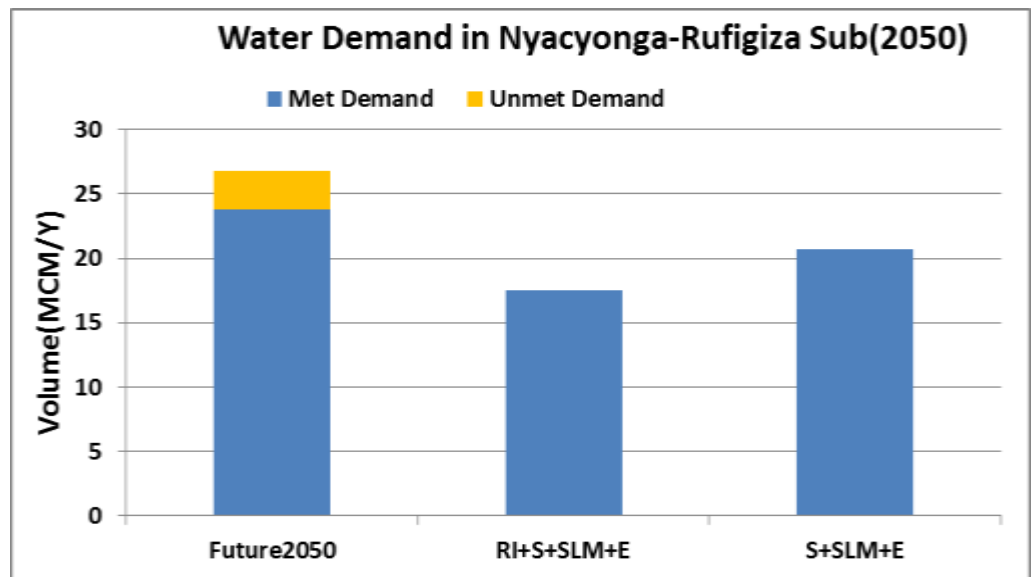
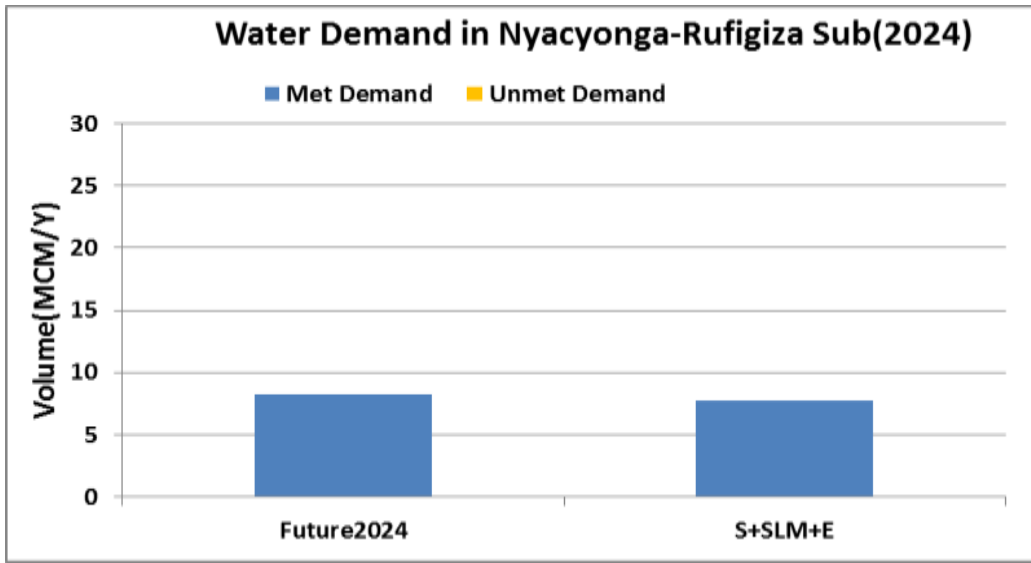
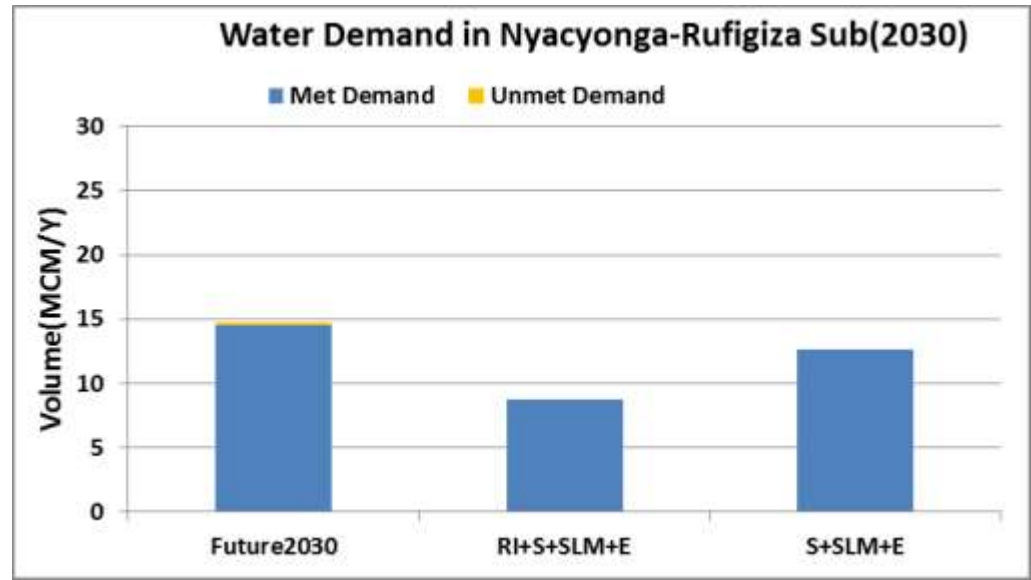
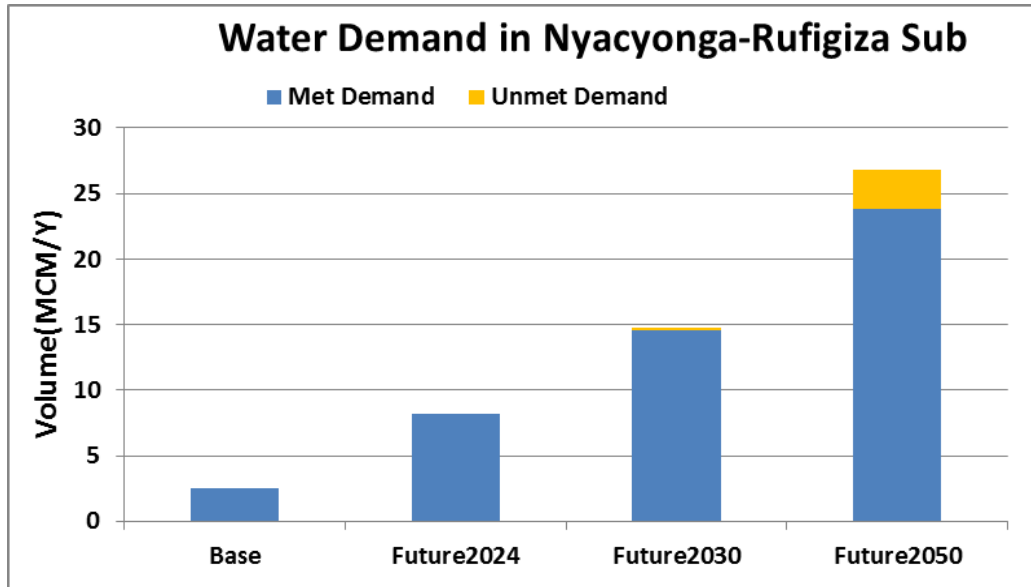


Water Demand in Muhazi Sub(2024)



Water Demand in Muhazi Sub(2050)

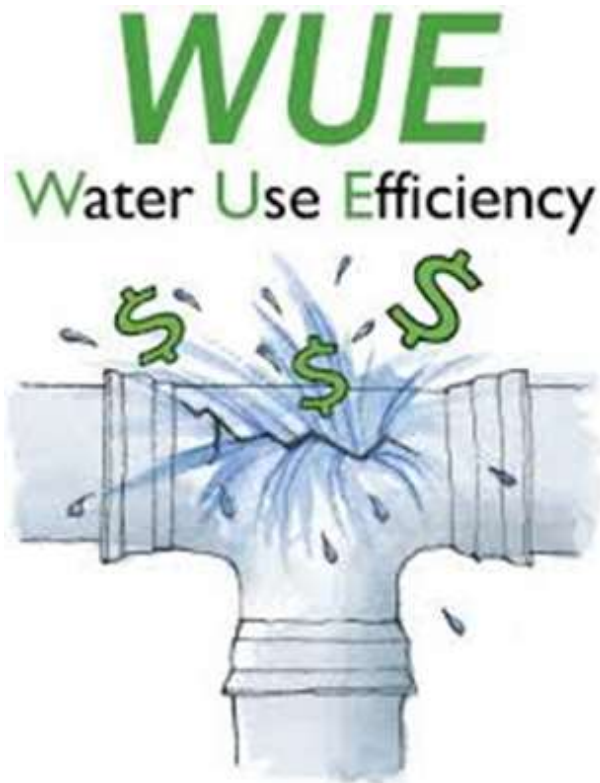




- **Note that;**
- In Nyabugogo catchment, 3 out of 6 sub-catchments need to reduce irrigation development; Muhazi, Mwange-Rusumo, and Yanze; the others can develop up to 100% of the IMP targets.
- In several sub-catchments, unmet demand reduces towards 2050, thanks to higher water use efficiencies and increased water storage.
- Irrigation development in all sub-catchments needs to go hand in hand with storage development and efficiency improvements.
- Speeding up development of storage and efficiency improvement, helps to avoid unmet water demand in 2024, 2030.

Conclusion and Recommendations

- In Nyabugogo and Muvumba catchments, there should be speeding up of water storage development and water use efficiency at least 30% in irrigation; 20% in domestic and industry by year 2030.
- **Is this possible?**



&



- **Yes, examples;**
- In a home with older toilets, an average flush uses about 13.6 liters, and the daily use is 71.2 liters per person per day. In a home with ultra-low-flow (ULF) toilets, with an average flush volume of 6 liters, the daily use is 34.4 liters per person per day.



- In coffee washing stations; 5kg cherries correspond to 5liters of water with Eco flex and 10liters of water of conventional machines
- Irrigation water use efficiency should be improved through different irrigation methods and irrigation scheduling.



Thank you very much