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**Establishing the feasibility of alleviating water shortages in Cape
Town using decentralised wastewater treatment plants**

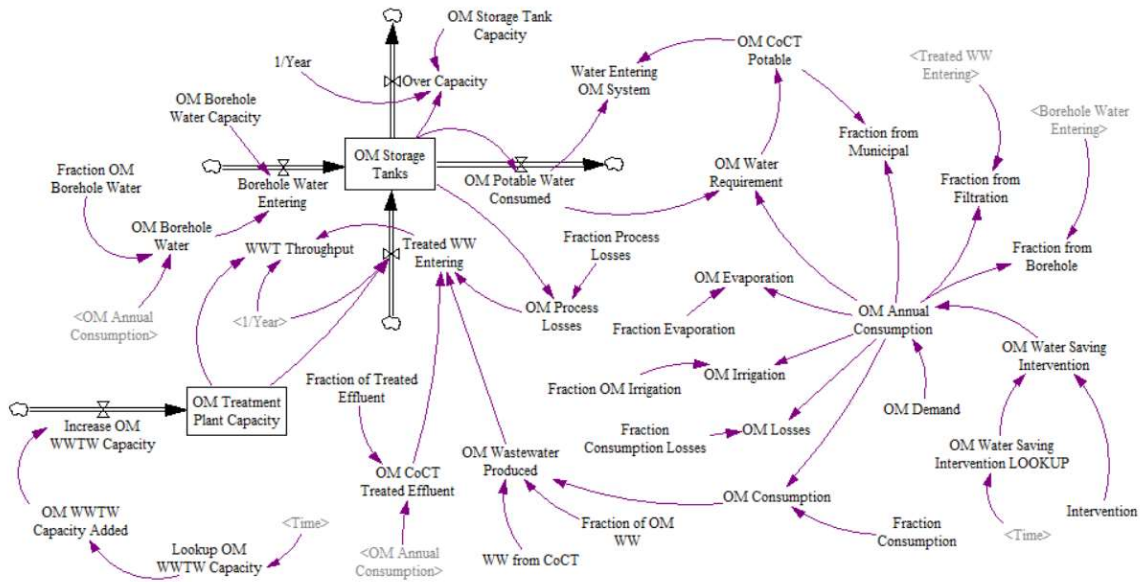
CALCULATIONS

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OM Storage Tanks = INTEG(Borehole Water Entering+Treated WW Entering-OM Potable Water Consumed-Over Capacity) + 0 (Unit: m3)

Borehole Water Entering = MIN(OM Borehole Water, OM Borehole Water Capacity) (Unit: m3/Year)

OM Potable Water Consumed = OM Storage Tanks (Unit: m3/Year)

Over Capacity = IF THEN ELSE(OM Storage Tanks>OM Storage Tank Capacity, ((OM Storage Tanks-OM Storage Tank Capacity)*"1/Year"), 0) (Unit: m3/Year)

Treated WW Entering = MIN((OM CoCT Treated Effluent+OM Wastewater Produced-OM Process Losses), (OM Treatment Plant Capacity*"1/Year")) (Unit: m3/Year)

OM Treatment Plant Capacity = 1 + INTEG(Increase OM WWTW Capacity) (Unit: m3)

Increase OM WWTW Capacity = OM WWTW Capacity Added (Unit: m3/Year)

OM WWTW Capacity Added = Lookup OM WWTW Capacity (Unit: m3/Year)

Lookup OM WWTW Capacity = WITH LOOKUP(Time) (Unit: m3/Year)

Look up OM WWTW = [(2001,0)-(2040,300000)], (2001,0), (2002,0), (2003,0), (2004,0), (2005,0),(2006,0),(2007,0),(2008,0),(2009,0), (2010,0), (2011,0), (2012,0), (2013,0), (2014,0), (2015,0), (2016,0), (2017,0),(2018,237250), (2019,0),(2020,0),(2021,0), (2022,0), (2023,0), (2024,0),(2025,0),(2026,0),(2027,0), (2028,0), (2029,0),(2030,0), (2031,0), (2032,0), (2033,0),(2034,0),(2035,0),(2036,0),(2037,0),(2038,0),(2039,0),(2040,0))

WWT Throughput = Treated WW Entering/("1/Year"*OM Treatment Plant Capacity) (Unit: Dimensionless)

OM Process Losses = Fraction Process Losses*OM Storage Tanks (Unit: m3/Year)

Fraction Process Losses = 0.05 (Unit: Dimensionless)

OM Borehole Water = Fraction OM Borehole Water*OM Annual Consumption (Unit: m3/Year)

Fraction OM Borehole Water – 0 (Unit: Dimensionless)

OM Annual Consumption = OM Demand*(1-OM Water Saving Intervention) (Unit: m3/Year)

OM Borehole Water Capacity = 91250 (Unit: m3/Year)

Over Capacity = IF THEN ELSE(OM Storage Tanks>OM Storage Tank Capacity, ((OM Storage Tanks-OM Storage Tank Capacity)*"1/Year"), 0) (Unit: m3/Year)

OM Storage Tank Capacity = 167900 (Unit: m3)

Water Entering OM System = OM CoCT Potable+OM Potable Water Consumed (Unit: m3/Year)

OM Water Requirement = OM Annual Consumption-OM Potable Water Consumed (Unit: m3/Year)

Fraction from Municipal = OM CoCT Potable/OM Annual Consumption (Unit: Dimensionless)

OM Annual Consumption = OM Demand*(1-OM Water Saving Intervention) (Unit: m3/Year)

OM Water Saving Intervention = 0*OM Water Saving Intervention LOOKUP + Intervention (Unit: Dimensionless)

OM Water Saving Intervention LOOKUP = WITH LOOKUP(Time) (Unit: Dimensionless)

Look up OM Water Saving Intervention = ([(2001,0)-(2040,0.5)],(2001,0), (2002,0), (2003,0),(2004,0), (2005,0),(2006,0),(2007,0), (2008,0),(2009,0),(2010,0), (2011,0),(2012,0), (2013,0), (2014,0), (2015,0),(2016,0.3),(2017,0.3),(2018,0.3), (2019,0.35),(2020,0.3), (2021,0.3),(2022,0.3),(2023,0.3), (2024,0.3),(2025,0.3),(2026,0.4), (2027,0.3),(2028,0.3), (2029,0.3), (2030,0.3),(2031,0.3),(2032,0.3), (2033,0.3),(2034,0.3),(2035,0.3),(2036,0.3), (2037,0.3),(2038,0.3),(2039,0.35),(2040,0.3)) (Unit: Dimensionless)

Intervention = 0.3 (Unit: Dimensionless)

OM Demand = 180000 (Unit: m3/Year)

OM Losses = Fraction Consumption Losses*OM Annual Consumption (Unit: m3/Year)

Fraction Consumption Losses = 0.07 (Unit: Dimensionless)

OM Irrigation = Fraction OM Irrigation*OM Annual Consumption (Unit: m3/Year)

Fraction OM Irrigation = 0.3 (Unit: Dimensionless)

OM Evaporation = OM Annual Consumption*Fraction Evaporation (Unit: m3/Year)

Fraction Evaporation = 0.1 (Unit: Dimensionless)

OM Consumption = Fraction Consumption*OM Annual Consumption (Unit: m3/Year)

OM Wastewater Produced = OM Consumption*Fraction of OM WW+WW from CoCT
(Unit: m3/Year)

WW from CoCT = 0 (Unit: m3/Year)

Fraction of OM WW = 0.97 (Unit: Dimensionless)

OM CoCT Treated Effluent = Fraction of Treated Effluent*OM Annual Consumption (Unit:
m3/Year)

Fraction of Treated Effluent = 0.25 (Unit: Dimensionless)