Water UML diagram

Population Growth Rate

TYPE: Value
Attributes
- GrowthRate (%): float

+ ChangeRate(GrowthRate)

Urbanization

TYPE: Value
Attributes
- URbanizationRate (%): float

+ ChangeRate(GrowthRate)

LandCover

TYPE: Raster/Polygon
Attributes
- Cover: int
- Material: int
- Infiltration_rate(mm/hr): float
- Area (km2): geom

+ LandCoverIdentif(RS Imagery)

Precipitation

TYPE: Point - Real time
Attributes
- id: int
- Station: string
- DateTime: dateTime
- Quantity(mm/d): float

Climate Change

TYPE: Value
Attributes
- ScenarioID: integer
- ScenarioName: string

+ ChangeScenario(ScenarioID)

Total Population

TYPE: Table
Attributes
- id: int
- Location: string
- CurrentPop: int
- PopYR20##: int
- AVGincome (M.U/mo): float

+ calculateNewPop (CurrentPop,GrowthRate)

ConsumptionCapita

TYPE: Value
Attributes
- ConsumptionCapita (L/capita-d): int

+ ChangeConsumption (ConsumptionCapita)

Infiltration year

TYPE: Raster
Attributes
- Quantity (cm/h): float

+ InfiltrationQuatity (Soil, Precipitation)

Area Affected by Drought

TYPE: Polygon
Attributes
- id: int
- Location: string
- sensibility: int
- Extension (Ha): float

+ Extension(Sensibility, pumpflow)

Available Fresh Water

TYPE: Polygon
Attributes
- id: int
- Location: string
- totalQuantity(Mm3): float
- Yeild(Mm3/year): float

Total Water Demand

TYPE: Table - Real Time
Attributes
- id: int
- demandD (Mm3/d): float
- demandYR (Mm3/yr): float

+ CalculateDemandD(Population, consumptionCapita)
+ CalculateDemandYR(DemandD)

CO2 eq Emission

TYPE: Table
Attributes
- id: int
- LocationID: int
- QuanitiyD (CO2eq/d): float
- QuanitiyYR (CO2eq/yr): float

+ CalculateQuanitiyD(PumpEmission)
+ CalculateQuanitiyYR(QuantityD)

Total Extraction

TYPE: Point - Real Time
Attributes
- id: int
- Location: string
- pumpflow (m3/s): float
- pumpMaxFlow (m3/s): float
- OperationTime (h/d): float
- depth (m): float
- pumpEfficiency (%): float
- pumpEnergyRate (kW/h): float
- pumpEmission (CO2eq/h): float

EnergyConsumption

TYPE: Table
Attributes
- id: int
- LocationID: int
- QuanitiyD (MW/d): float
- QuanitiyYR (GW/yr): float

+ CalculateQuanitiyD(TotalExtraction.pumpflow, TotalExtraction.OperationTime, TotalExtraction.pumpEnergyRate)
+ CalculateQuanitiyYR(QuantityD)

Energy Cost

TYPE: Table - Real Time
Attributes
- LocationID: int
- Price (M.U/kW): float

Service Time

TYPE: Table - Real Time
Attributes
- id: int
- serviceTime(h/d)

Supply Security

TYPE: Table
Attributes
- id: int
- LocationID: int
- Security (%): float
- SecurityGoal (%): float

+ CalculateSecurity(Total Production, Total Demand)

Total Water Production

TYPE: Table - Real Time
Attributes
- id: int
- QuanitiyD (CO2eq/d): float
- QuanitiyYR (CO2eq/yr): float
- CostD (M.U./d): float
- CostYR (M.U./d): float

+ CalculateQuanitiyD(PumpEmission, ImportWater)
+ CalculateQuanitiyYR(QuantityD)
+ CostD(QuantityD, price, importQD)
+ CostYR(CostD)

Imported Water

TYPE: Table - Real Time
Attributes
- LocationID: int
- QuantityD (m3/d): float
- Price (M.U/kW): float

CityArea

TYPE: Polygon
Attributes
- Name: String
- Extension (km2): float
- ExpansionRate (%): float

+ CalculateExpansion(CurrentPop, PopYR20##)

Network

TYPE: Line
Attributes
- id: int
- Length (km): float
- mantainanceCost (M.U./km-yr): float

OPEX

TYPE: Value
Attributes
- UnitaryOPEX (M.U./m3)
- TotalOPEX

+ CalculateUnitaryOPEX(WaterProduction.CostD, WaterTreatment.CostD, TotalNetwork.MantainanceCostD, EnergyCompsumtion.CostD)
+ CalculateTotalOPEX(WaterProduction.QuantityD, WaterProduction.CostD,WaterTreatment.CostD, TotalNetwork.MantainanceCostD, EnergyCompsumption.QuantityD, EnergyCompsumtion.CostD)

Water Treatment Cost

TYPE: Value
Attributes
- Tariff (M.U./m3): float

Water Treatment Efficiency

TYPE: Value
Attributes
- Efficiency (%): float

Samples Meeting WQ standards

TYPE: Table
Attributes
- sampleId: int
- Overall Water Quality : float

Samples Taken

TYPE: Vale
Attributes
- sampleId: int

CoverageWaterSupplyArea

TYPE: Polygon
Attributes
- id: int
- Name: int
- CoveredArea(km2): float
- PctCoverage (%): float

+ CalculateCoveredArea (CityArea, Network)
+ CalculatePctCover (CityArea,CoveredArea)

Water Tariff Affordability

TYPE: Table
Attributes
- Tariff (M.U./m3): float
- PCTaffordability (%): float

+ CalculateAffordability (CurrentPop, AVGincome, Tariff)

ApparentLosses

TYPE: Table
Attributes
- id: int
- Type: string
- WaterAmmount (m3/d): float
- WaterCost (M.U./d): float

+ CalculateWaterCost (WaterAmount, WaterCost)

Real Losses

TYPE: Point
Attributes
- id: int
- Location: geom
- Type: String
- WaterAmmount (m3/d): float
- WaterCost (M.U./d): float
- UnavoidableLoss (%): float

+ CalculateWaterCost (WaterAmount, WaterCost)

User Acceptance

TYPE: Value
Attributes
- AcceptanceRate (%) : float

NumberUsers

TYPE: Polygon
Attributes
- id: int
- neighbourhoodName: string
- Users: int
- ResidentialUser : int
- CommercialUser: int
- IndustrialUser: int
- **populationWithAccess: int**

+ CalculatePopAccess (CurrentPop)

Metered Residential Water

TYPE: Table
Attributes
- usersID: int
- installedMeters: int
- **functionalMeters: int**

CollectionRatio

TYPE: Table
Attributes
- RecoveryPCT (%): float

OPEX Recovery

TYPE: Table
Attributes
- TotalaRecovery (M.U.): float

+ CalculateRecovery (OPEX, CollectionRatio

Non Revenue Water

TYPE: Table
Attributes
- TotalNRWD (m3/d): float
- TotalNRWYR (m3/yr): float

+ CalculateAffordability (CurrentPop, AVGincome)

CoverageWaterSupply

TYPE: Value
Attributes
- Coverage (%)

Infrastructure Leakage Index

TYPE: Value
Attributes
- ID: float

+ CalculateILI (RealLoss, UnavoidableRealLoss)