Putting the Pieces Together: Interagency Agreements for Integrated Water Use

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South Bay Water Recycling Interagency Partners

San Jose/Santa Clara Water Pollution Control Plant Joint Powers Authority

- City of San Jose
- City of Santa Clara
- City of Milpitas
- West Valley Sanitation District
- County Sanitation District 2-3
- Cupertino Sanitary District
- Burbank Sanitary District
- Sunol Sanitary District

Implementing Agencies

- City of San Jose Public Works Department
- City of Santa Clara Public Works Department
- City of Milpitas Public Works Department
- Santa Clara Valley Water District

Water Retailers

- San Jose Water Company
- Milpitas Water Department
- Santa Clara Water Department
- San Jose Municipal Water Service
- Great Oaks Water Company

Regulatory and Funding Agencies

- Santa Clara Valley Water District
- State Water Resources Control Board
- SF Regional Water Quality Control Board
- US Bureau of Reclamation
- US Fish and Wildlife Service

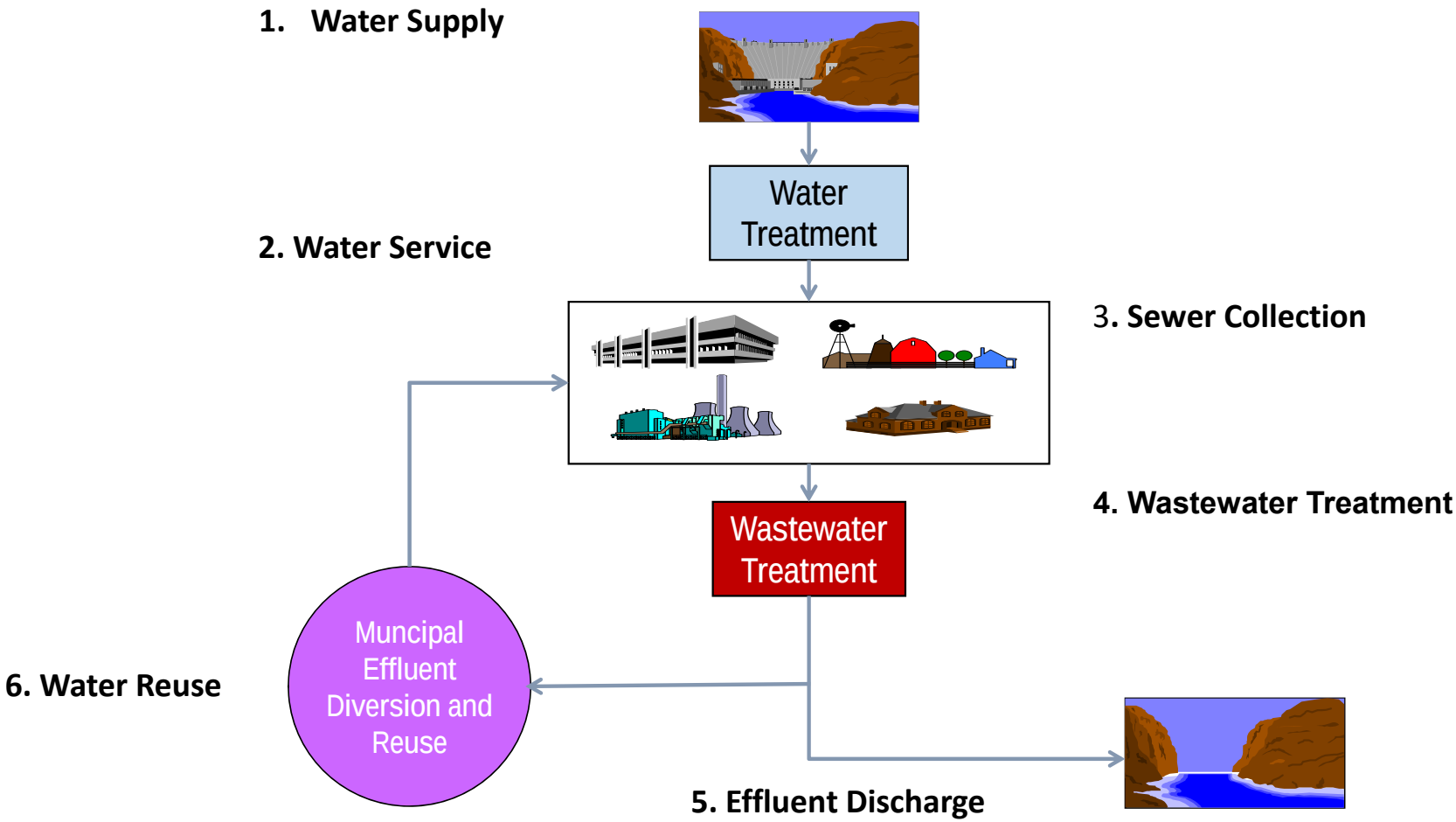
Agreements Key to Water Reuse

- **Public Interagency Agreements**
  - City of Pleasanton/DSRSD
  - Cities of Pleasanton/Livermore
  - City of Richmond/WCWD
  - Napa County Sanitation District/Los Carneros Water District
  - Cities of South San Francisco/San Bruno/Burlingame/Millbrae
- **Private Sector/Public Agency Agreements**
  - Connection to municipal recycled water system
  - Permitting and support for onsite use of treated wastewater
  - Permit to supply treated industrial wastewater for external reuse

Putting the Pieces Together: Interagency Agreements for Integrated Water Use

1. **Institutional challenges to water reuse**
   a. Separate jurisdictions
   b. Fragmented planning, management and finance
   c. Limited tolerance for risk
2. **Elements of water reuse agreements**
   a. Quantity, quality and pressure
   b. Response to system failure, interruption
   c. Regulation, ownership and compensation
   d. Liability and risk
3. **Integrated planning, management for "virtual abundance"**

The urban hydrologic cycle



Institutional challenges: roles and responsibilities

Roles and responsibilities	**Agency or authority**
• Allocate water rights	• State water department
• Regional water supply	• Water wholesaler
• Local water supply	• Water retailer
• Wastewater collection	• City, sanitary district
• Wastewater treatment	• City, sanitation agency
• Effluent disposal	• Discharge authority
• Stormwater management	• Flood control district
• Water recycling	• City, sanitation agency, water wholesaler, water retailer, industrial water customer

Water reuse rights, responsibilities, partners, permits and agreements

Rights, roles and responsibilities	Permits and agreements	Agencies involved
Effluent treatment	NPDES discharge permit; capacity purchase or joint powers agreement	RWQCB; City, wastewater authority or sanitation agency
Ownership/rights to use	JPA and/or change petition	SWRCB; water and wastewater agencies
Operation of recycled water system	Recycled water permit	SWRCB or RWQCB; NPDES permit holder or water wholesaler, retailer
Recycled water distribution	Recycled water permit and recycled water service agreements	Wastewater and/or water agency and municipal or investor-owned water retailers
Recycled water meter service	Recycled water retailer or franchise agreement; customer agreement	Recycled water permit holder and municipal or investor-owned water retailer; customer
Facility compliance	Building permits and CEQA certification	Municipal jurisdiction, lead agency or facility owner

Separate jurisdictions complicate northern California water reuse

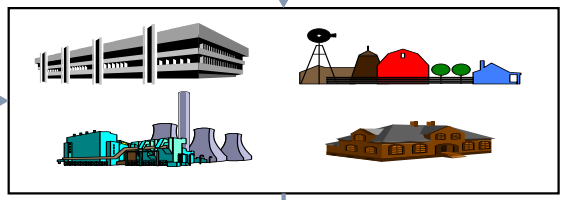
1. Water Supply

- San Francisco Public Utilities Commission (SFPUC)
- Bay Area Water Supply and Conservation Agency (BAWSCA)

Water Treatment

2. Water Service

- California Water Service
- Burlingame
- San Bruno
- Millbrae



3. Sewer Collection

- South San Francisco
- Burlingame
- Millbrae
- San Bruno

Potential Reuse Partners

Wastewater Treatment

4. Wastewater Treatment

- South San Francisco/San Bruno
- Burlingame
- Millbrae
- SFO

Muncipal Effluent Diversion and Reuse

6. Water Reuse

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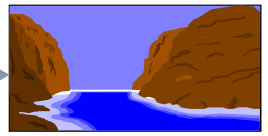


5. Effluent Discharge

- North Bayside System Unit (NBSU)

Existing institutions protect ownership rights, define agency jurisdiction

- 19th and 20th century legislation, regulations and institutions promoted development of relatively abundant natural resources
  - Water allocation guaranteed private riparian, appropriative rights
  - Water utilities guaranteed return on investment, service area monopoly
  - Sanitary districts focused on collection, disposal
- Externalities accrued to the public sector
  - Water shortages ascribed to natural causes, “acts of God”
  - Water pollution constrained by tort law prior to 1972 Clean Water Act, EPA
  - National, regional water plans (US Bureau of Reclamation, LA Water & Power, SFPUC) designed for limited local benefit

Fragmented planning, management, finance

To overcome fragmentation, agencies must:

- Work together to identify opportunities and obstacles to integrated, sustainable water use
- Collaborate to manufacture, market, price and distribute recycled water
- Assign responsibility for servicing and monitoring recycled water customers
- Identify and monetize their individual interests in reuse to determine funding contributions

Fragmentation limits funding, liability

- Financial contribution to capital and operating costs
- Asset management, maintenance and replacement costs
- Assume responsibility for:
  - Regulatory monitoring and reporting
  - Finding, reporting and repairing main breaks
  - Shortfalls in recycled water supply
  - Deviations in water quality

Relative Criticality (Kr) of Factors Affecting Reuse

Subtracting this value from 1 yields the *consensus index* ($c = 1- Kr/n$) which equals unity when all participants agree (i.e. $Kr/n = 0$) and approaches 0 the more they differ ($Kr/n = 1$).

Criticality (K) and relative criticality (K_r) can be used to estimate the time required to reach a decision. If the time (t) increases with the number of participants (n) and decreases with their motivation (m), this relationship is expressed as $t=f(n/m)$ (Equation 1). Motivation can be described as the product of criticality (K) and the consensus index (c) or $m = cK$ (Equation 2). Substituting $1- Kr/n$ for c in Equation 2 and cK for m in Equation 1 yields:

$t = f(n/m)$ (Eq. 1)

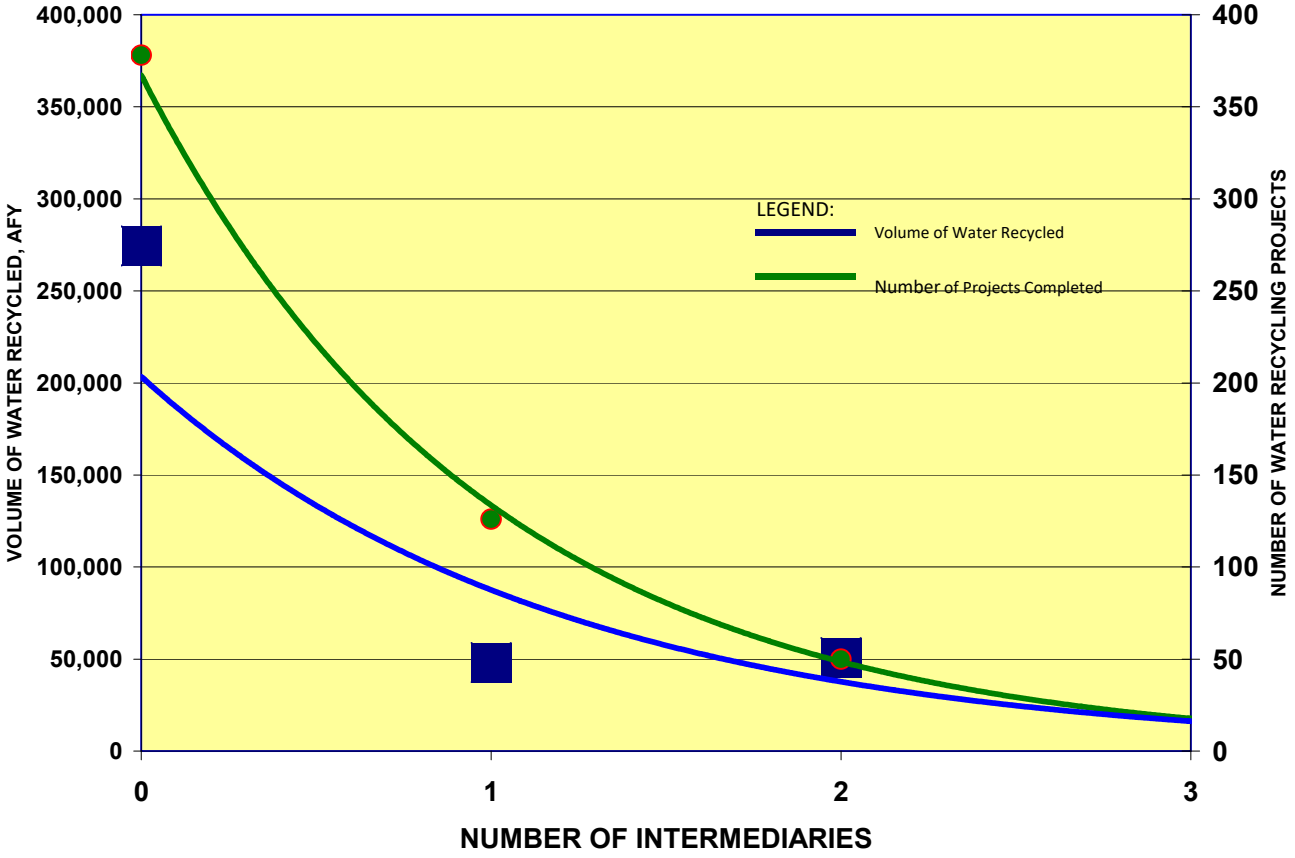
$m = cK$ (Eq. 2)

$c = 1-Kr/n$ (Eq. 3)

$$t = \frac{n^2}{K(n-Kr)}$$

from Rosenblum, E. and Anderson, J. **"The Water Reclamation Matrix: A Framework for Sustainable Urban Water Use."**

Number of Intermediaries vs. Success of Reuse Projects



Elements of water reuse agreements

- Quantity, quality and pressure
- Regulation, liability and risk
- Ownership and compensation

Elements of water reuse agreements

Desired outcome

- Agency A delivers recycled water to Agency B
- The water meets Agency B standards (quality, pressure)
- Agency B customers use recycled water appropriately
- Agency B compensates Agency A adequately to maintain system

Unwelcome events

- Plant shutdown, main break
- Treatment failure
- Scheduled and unscheduled maintenance
- Customer cross-connection, overflow and discharge
- Insufficient revenues or windfall profits

Elements of water reuse agreements

1. **Water quantity**
   - Average annual supply (AFY)
   - Maximum daily flow (mgd)
   - Peak hourly flow rate (gpm)
   - Location of mains, laterals, turnouts
2. **Water quality and pressure**
   - Minimum quality (e.g. Title 22)
   - Treatment methods (e.g. advanced treatment)
   - Maximum and minimum pressure (psi)
   - Additional quality issues (e.g. constituents appropriate for projected use)

Additional Industrial Reuse Quality Parameters

Constituent	Units	Instantaneous Maximum		Reporting Expected Maximum	
		Nitrified Limit	Frequency	Nitrified Limit	Frequency
Ammonia	mg/L	0.20	Daily		
Calcium	mg/L			80	Monthly
Chloride	mg/L			350	Monthly
Conductivity	µS/cm			1960	Daily
Iron (total)	mg/L	0.25	Weekly		
Magnesium	mg/L			40	Monthly
pH	s.u.	6.5-8.5	Daily		
Silica	mg/L			30	Weekly
Sulfate	mg/L			180	Monthly
Total Alkalinity $CaCO_3$	mg/L	800-120	Weekly		
Total Phosphate as PO_4	mg/L	2.0	Weekly		
TDS	mg/L			1254	Daily (1)

Elements of water reuse agreements (cont'd)

3. **Response to interruptions**
   - Identification and repair of leaks, breaks and illegal discharges
   - Notification of deviations in water quality, pressure and restoration of service
   - Delivery shortfalls and responsibility for supplemental supplies
4. **Regulation and authority**
   - Permit authority under which recycled water is distributed
   - Responsibility for monitoring and reporting water quality
   - Permitting, inspection and monitoring of users
   - Promulgation of guidelines
   - Site supervisor training

Elements of water reuse agreements (cont'd)

5. **Ownership**
   - Ownership of treatment, distribution facilities
   - Distribution of grants, revenues (if jointly owned)
   - Responsibility for asset management and capital replacement
6. **Compensation**
   - Wholesale and retail water rates and escalators (e.g. indexed rate, CPI)
   - Invoicing and payment terms (e.g. metered use, "take or pay")
   - Measurement and verification of water deliveries
   - Other fees and charges (e.g. maintenance, training, billing

Elements of water reuse agreements (cont'd)

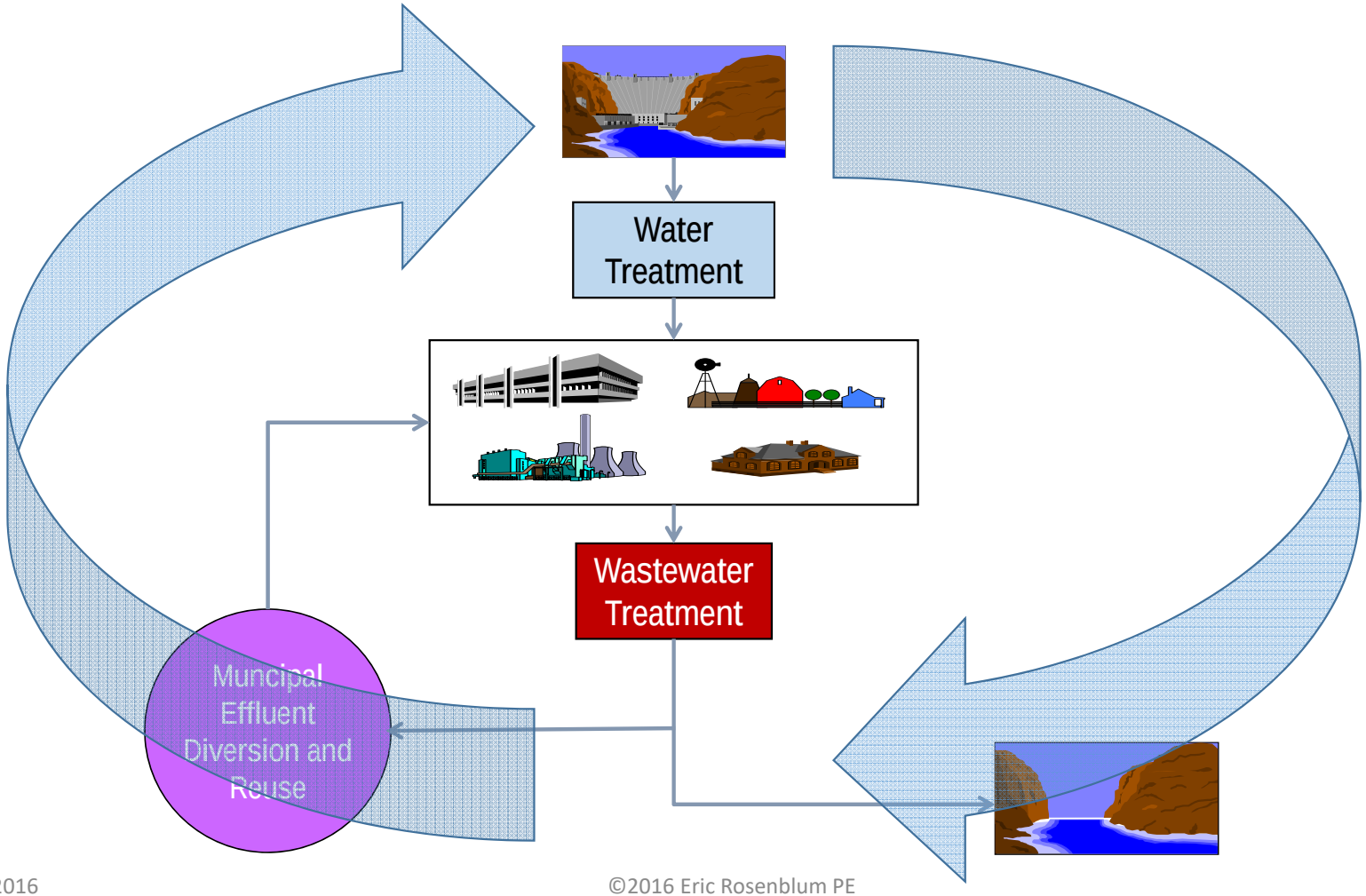
7. Liability and Risk

- Mutual indemnification
- Limitations on liability ("Hold harmless")
- Term of agreement and provisions for renewal
- Severability

Industrial Reuse Agreement Provisions

Provision	Purpose
Recycled water rate	Recover recycled water treatment plant and pipeline CAPEX, OPEX costs
Connection fee	Recover CAPEX costs for recycled water treatment or pipeline extension
Meter charge	Recover cost of setting meter and opening account
Wastewater charge	Encourage recycled water use by reducing cost of wastewater discharge
Long-term use	Guarantee long-term revenue from recycled water rates
Take-or-Pay	Guarantee minimum regular revenue to cover CAPEX, OPEX costs
Interruptibility	Reserve right to interrupt recycled water supply without liability
Water Quality	Reserve right to provide recycled water of variable quality without liability
Pressure	Reserve right to provide recycled water of variable pressure
Cost-sharing	Guarantees a minimum contribution from customer for CAPEX investment

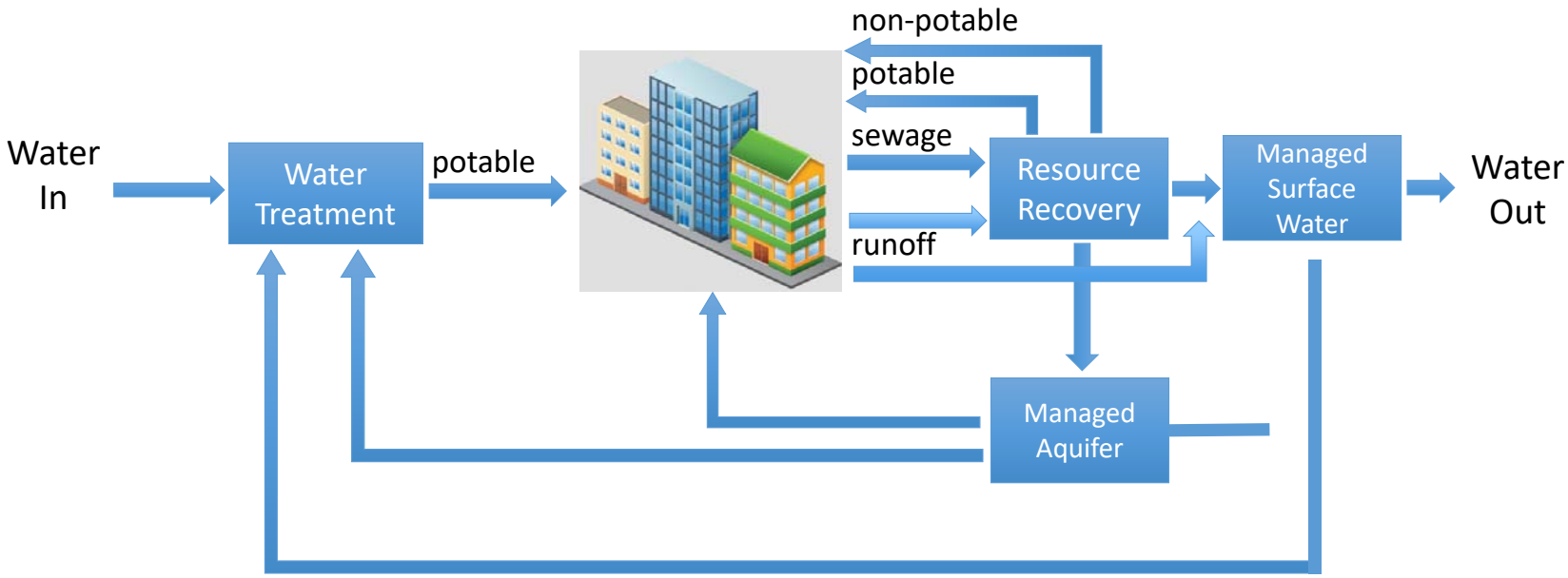
Agreements promote holistic water planning, decision-making



21st century institutions, laws will promote collaboration to produce "virtual abundance"

- Planning moves flexibly between watershed, community, cluster and building scales
- Economic analyses include short-term and long-term environmental impacts, monetize externalities
- Decision-making includes alternative water supplies, water demand substitutes
- Decentralization allows more efficient use of energy, water
- Greater emphasis on community engagement

Water 4.0: Comprehensive integrated water management

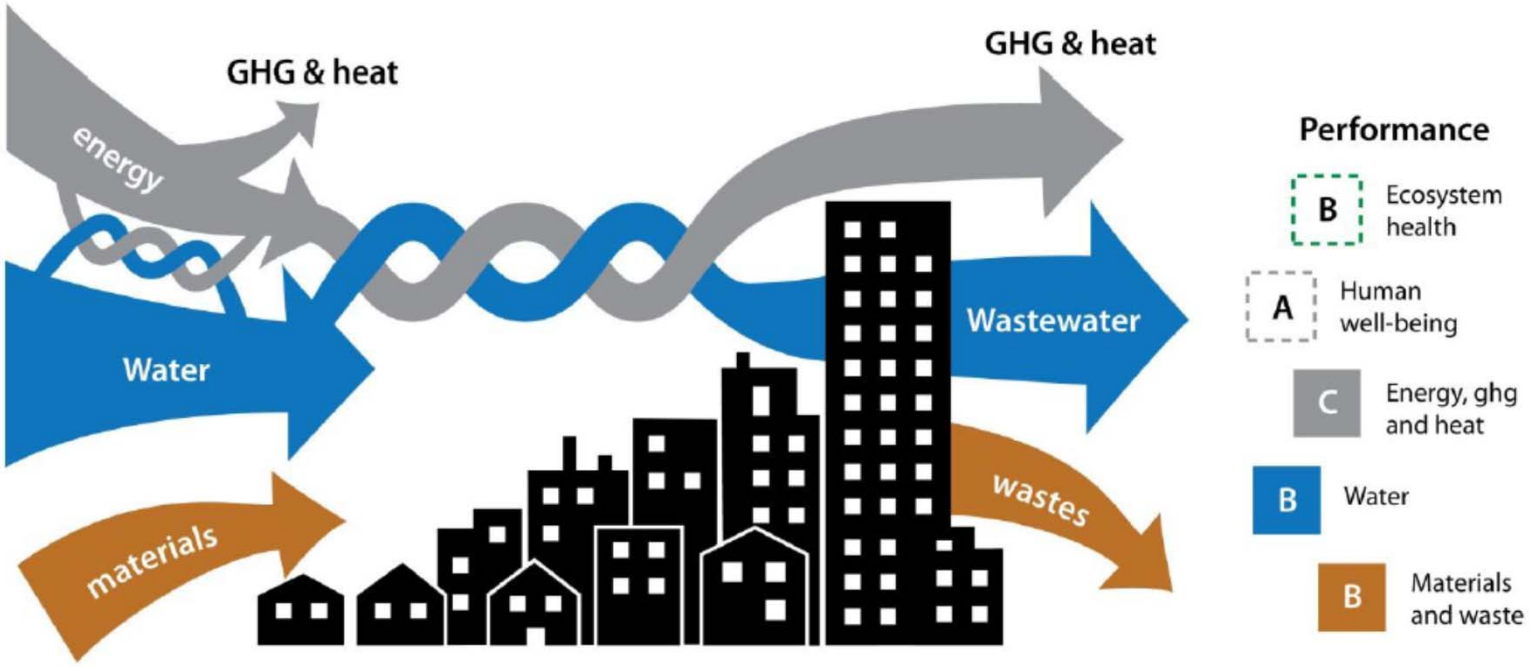


Source: Prof. David Sedlak, University of California, Berkeley
http://www.ce.berkeley.edu/people/faculty/sedlak

“Soft Path” Principles (Pacific Institute)

1. Focus on sustainable ways to satisfy the needs of people and businesses, instead of just supplying water.
2. Different qualities for different uses.
3. Decentralized infrastructure can be just as cost-effective as investing in large, centralized facilities.
4. The soft path requires water agency or company personnel to interact closely with water users and to engage community groups in water management.
5. The health of our natural world and the activities that depend on it (like swimming and tourism) are important to water users and people in general.
6. **An economy of scope exists when a combined decision-making process would allow specific services to be delivered at a lower cost than would result from separate decision-making.**

Towards a holistic view of cities



from Steven Kenway, "**The Water-Energy Nexus and Urban Metabolism - Connections in Cities**" *Urban Water Security Research Alliance Technical Report No. 100*

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