DOWNLOAD PDF WATER SUPPLY AND MANAGEMENT

Chapter 1 : Water supply management - SUEZ

Integrated Regional Water Management, commonly known as IRWM, aims to collectively manage all aspects of water resources in a region. This approach includes all constituencies, including those that traditionally have been outside of the water planning and policy process such as tribal representatives.

Overview[edit] Visualisation of the distribution by volume of water on Earth. The entire block comprises 1 million tiny cubes. Of the water resources on Earth only three percent of it is fresh and two-thirds of the freshwater is locked up in ice caps and glaciers. Of the remaining one percent, a fifth is in remote, inaccessible areas and much seasonal rainfall in monsoonal deluges and floods cannot easily be used. As time advances, water is becoming scarcer and having access to clean, safe, drinking water is limited among countries. At present only about 0. Due to the small percentage of water remaining, optimizing the fresh water we have left from natural resources has been a continuous difficulty in several locations worldwide. Much effort in water resource management is directed at optimizing the use of water and in minimizing the environmental impact of water use on the natural environment. The observation of water as an integral part of the ecosystem is based on integrated water resource management, where the quantity and quality of the ecosystem help to determine the nature of the natural resources. As a limited resource, water supply sometimes supposes a challenge. This project faced a difficult task for developing areas: The DESAFIO engineers worked on a water treatment system run with solar power and filters which provides safe water to a very poor community in the state of Minas Gerais. For water as a resource, this is particularly difficult since sources of water can cross many national boundaries and the uses of water include many that are difficult to assign financial value to and may also be difficult to manage in conventional terms. Examples include rare species or ecosystems or the very long term value of ancient groundwater reserves. An assessment of water resource management in agriculture was conducted in by the International Water Management Institute in Sri Lanka to see if the world had sufficient water to provide food for its growing population or not. Regarding food production, the World Bank targets agricultural food production and water resource management as an increasingly global issue that is fostering an important and growing debate. To avoid a global water crisis, farmers will have to strive to increase productivity to meet growing demands for food, while industry and cities find ways to use water more efficiently. This rapid urbanization happens worldwide but mostly in new rising economies and developing countries. Cities in Africa and Asia are growing fastest with 28 out of 39 megacities a city or urban area with more than 10 million inhabitants worldwide in these developing nations. With developing economies water scarcity is a very common and very prevalent issue. As cities offer the best opportunities for selling produce, farmers often have no alternative to using polluted water to irrigate their crops. Wastewater from cities can contain a mixture of pollutants. There is usually wastewater from kitchens and toilets along with rainwater runoff. This means that the water usually contains excessive levels of nutrients and salts, as well as a wide range of pathogens. Heavy metals may also be present, along with traces of antibiotics and endocrine disruptors , such as oestrogens. Developing world countries tend to have the lowest levels of wastewater treatment. Often, the water that farmers use for irrigating crops is contaminated with pathogens from sewage. Common illnesses include diarrhoea , which kills 1. Many cholera outbreaks are also related to the reuse of poorly treated wastewater. Actions that reduce or remove contamination, therefore, have the potential to save a large number of lives and improve livelihoods. This involves analysing the food production process from growing crops to selling them in markets and eating them, then considering where it might be possible to create a barrier against contamination. The UDSS is then able to analyse and show homeowners which of their appliances are using the most water, and which behaviour or habits of the households are not encouraged in order to reduce the water usage, rather than simply giving a total usage figure for the whole property, which will allow people to manage their consumption more economically. The UDSS is based on university research in the field of Management Science , at Loughborough University School of Business and Economics, particularly Decision Support System in household water benchmarking, led by Dr Lili Yang , Reader [15] Future of water resources[edit] One of the biggest concerns for our water-based resources in the future is the sustainability of the current and even future water resource allocation. Finding a balance between what is needed by humans and what is needed in the environment is an important step in the sustainability of water resources. Attempts to create sustainable freshwater systems have been seen on a national level in countries such as Australia , and such commitment to the environment could set a model for the rest of the world. The field of water resources management will have to continue to adapt to the current and future issues facing the allocation of water. With the growing uncertainties of global climate change and the long term impacts of management actions,the decision-making will be even more difficult. It is likely that ongoing climate change will lead to situations that have not been encountered. As a result, alternative management strategies are sought for in order to avoid setbacks in the allocation of water resources.

Chapter 2 : Water Resource Management Strategies

Water Utility Management serves over 25, homes in Georgia. We aim to provide our customers with safe, reliable Drinking Water and Wastewater service, and an outstanding customer experience.

Water abstraction Raw water untreated is collected from a surface water source such as an intake on a lake or a river or from a groundwater source such as a water well drawing from an underground aquifer within the watershed that provides the water resource. The raw water is transferred to the water purification facilities using uncovered aqueducts, covered tunnels or underground water pipes. Water treatment must occur before the product reaches the consumer and afterwards when it is discharged again. Water purification usually occurs close to the final delivery points to reduce pumping costs and the chances of the water becoming contaminated after treatment. Traditional surface water treatment plants generally consists of three steps: Clarification refers to the separation of particles dirt, organic matter, etc. Sand, anthracite or activated carbon filters refine the water stream, removing smaller particulate matter. While other methods of disinfection exist, the preferred method is via chlorine addition. Chlorine effectively kills bacteria and most viruses and maintains a residual to protect the water supply through the supply network. Water distribution network[edit] The Central Arizona Project Aqueduct transfers untreated water Most treated water distribution happens through underground pipes Pressurizing the water is required between the small water reserve and the end-user The product, delivered to the point of consumption, is called potable water if it meets the water quality standards required for human consumption. The water in the supply network is maintained at positive pressure to ensure that water reaches all parts of the network, that a sufficient flow is available at every take-off point and to ensure that untreated water in the ground cannot enter the network. The water is typically pressurised by pumps that pump water into storage tanks constructed at the highest local point in the network. One network may have several such service reservoirs. In small domestic systems, the water may be pressurised by a pressure vessel or even by an underground cistern the latter however does need additional pressurizing. This eliminates the need of a water-tower or any other heightened water reserve to supply the water pressure. These systems are usually owned and maintained by local governments, such as cities, or other public entities, but are occasionally operated by a commercial enterprise see water privatization. Water supply networks are part of the master planning of communities, counties, and municipalities. Their planning and design requires the expertise of city planners and civil engineers , who must consider many factors, such as location, current demand, future growth, leakage, pressure, pipe size, pressure loss, fire fighting flows, etc. As water passes through the distribution system, the water quality can degrade by chemical reactions and biological processes. Corrosion of metal pipe materials in the distribution system can cause the release of metals into the water with undesirable aesthetic and health effects. Release of iron from unlined iron pipes can result in customer reports of "red water" at the tap. Release of lead can occur from the solder used to join copper pipe together or from brass fixtures. Utilities will often adjust the chemistry of the water before distribution to minimize its corrosiveness. The simplest adjustment involves control of pH and alkalinity to produce a water that tends to passivate corrosion by depositing a layer of calcium carbonate. Corrosion inhibitors are often added to reduce release of metals into the water. Common corrosion inhibitors added to the water are phosphates and silicates. Maintenance of a biologically safe drinking water is another goal in water distribution. Typically, a chlorine based disinfectant , such as sodium hypochlorite or monochloramine is added to the water as it leaves the treatment plant. Booster stations can be placed within the distribution system to ensure that all areas of the distribution system have adequate sustained levels of disinfection. Topologies of water distribution networks[edit] Like electric power lines, roads, and microwave radio networks, water systems may have a loop or branch network topology, or a combination of both. The piping networks are circular or rectangular. If any one section of water distribution main fails or needs repair, that section can be isolated without disrupting all users on the network. Most systems are divided into zones. Sometimes systems are designed for a specific area then are modified to accommodate development. Terrain affects hydraulics and some forms of telemetry. While each zone may operate as a stand-alone system, there is usually some arrangement to interconnect zones in order to manage equipment failures or system failures. Water network maintenance[edit] Water supply networks usually represent the majority of assets of a water utility. Systematic documentation of maintenance works using a computerized maintenance management system CMMS is a key to a successful operation of a water utility. Sustainable urban water supply[edit] A sustainable urban water supply network covers all the activities related to provision of potable water. Sustainable development is of increasing importance for the water supply to urban areas. Incorporating innovative water technologies into water supply systems improves water supply from sustainable perspectives. The development of innovative water technologies provides flexibility to the water supply system, generating a fundamental and effective means of sustainability based on an integrated real options approach. It is needed in every industrial and natural process, for example, it is used for oil refining , for liquid-liquid extraction in hydro-metallurgical processes, for cooling, for scrubbing in the iron and the steel industry, and for several operations in food processing facilities. It is necessary to adopt a new approach to design urban water supply networks; water shortages are expected in the forthcoming decades and environmental regulations for water utilization and waste-water disposal are increasingly stringent. To achieve a sustainable water supply network, new sources of water are needed to be developed, and to reduce environmental pollution. The price of water is increasing, so less water must be wasted and actions must be taken to prevent pipeline leakage. Shutting down the supply service to fix leaks is less and less tolerated by consumers. A sustainable water supply network must monitor the freshwater consumption rate and the waste-water generation rate. The building of new illegal settlements makes it hard to map, and make connections to, the water supply, and leads to inadequate water management. Water scarcity[edit] Potable water is not well distributed in the world. Poor people in developing countries can be close to major rivers, or be in high rainfall areas, yet not have access to potable water at all. There are also people living where lack of water creates millions of deaths every year. Where the water supply system cannot reach the slums, people manage to use hand pumps , to reach the pit wells, rivers , canals , swamps and any other source of water. In most cases the water quality is unfit for human consumption. The principal cause of water scarcity is the growth in demand. Water is taken from remote areas to satisfy the needs of urban areas. Another reason for water scarcity is climate change: Governmental issues[edit] In developing countries many governments are corrupt and poor and they respond to these problems with frequently changing policies and non clear agreements. The Millennium Development Goals propose the changes required. In advanced economies, the problems are about optimising existing supply networks. These economies have usually had continuing evolution, which allowed them to construct infrastructure to supply water to people. The European Union has developed a set of rules and policies to overcome expected future problems. There are many international documents with interesting, but not very specific, ideas and therefore they are not put into practice. Optimizing the water supply network[edit] The yield of a system can be measured by either its value or its net benefit. For a water supply system, the true value or the net benefit is a reliable water supply service having adequate quantity and good quality of the product. For example, if the existing water supply of a city needs to be extended to supply a new municipality , the impact of the new branch of the system must be designed to supply the new needs, while maintaining supply to the old system. Single-objective optimization[edit] The design of a system is governed by multiple criteria, one being cost. If the benefit is fixed, the least cost design results in maximum benefit. However, the least cost approach normally results in a minimum capacity for a water supply network. A minimum cost model usually searches for the least cost solution in pipe sizes , while satisfying the hydraulic constraints such as: The cost is a function of pipe diameters; therefore the optimization problem consists of finding a minimum cost solution by optimising pipe sizes to provide the minimum acceptable capacity. The problem changes from a single objective optimization problem minimizing cost , to a multi-objective optimization problem minimizing cost and maximizing flow capacity. The weighted sum approach gives a certain weight to the different objectives, and then factors in all these weights to form a single objective function that can be solved by single factor optimization. This method is not entirely satisfactory, because the weights cannot be correctly chosen, so this approach cannot find the optimal solution for all the original objectives. The constraint method[edit] The second approach the constraint method , chooses one of the objective functions as the single objective, and the other objective functions are treated as constraints with a limited value. However, the optimal solution depends on the pre-defined constraint limits. Sensitivity analysis[edit] The multiple objective optimization problems involve computing the tradeoff between the costs and benefits resulting in a set of solutions that can be used for sensitivity analysis and tested in different scenarios. But there is no single optimal solution that will satisfy the global optimality of both objectives. As both objectives are to some extent contradictory, it is not possible to improve one objective without sacrificing the other. It is necessary in some cases use a different approach e. Pareto Analysis , and choose the best combination. Operational constraints[edit] Returning to the cost objective function, it cannot violate any of the operational constraints. Generally this cost is dominated by the energy cost for pumping. Apart from Linear and Non-linear Programming, there are other methods and approaches to design, to manage and operate a water supply network to achieve sustainabilityâ€"for instance, the adoption of appropriate technology coupled with effective strategies for operation and maintenance. These strategies must include effective management models, technical support to the householders and industries, sustainable financing mechanisms, and development of reliable supply chains. All these measures must ensure the following: Sustainable development[edit] In an unsustainable system there is insufficient maintenance of the water networks, especially in the major pipe lines in urban areas. The system deteriorates and then needs rehabilitation or renewal. Sustainable development in an urban water network Householders and sewage treatment plants can both make the water supply networks more efficient and sustainable. Major improvements in eco-efficiency are gained through systematic separation of rainfall and wastewater. Membrane technology can be used for recycling wastewater. It applies a water reuse scheme for treated wastewater, on a municipal scale, to provide non-potable water for industry, household and municipal uses. This technology consists in separating the urine fraction of sanitary wastewater, and collecting it for recycling its nutrients. The water is treated anaerobically and the biogas is used for energy production. The sustainable water supply system is an integrated system including water intake, water utilization, wastewater discharge and treatment and water environmental protection. It requires reducing freshwater and groundwater usage in all sectors of consumption. Gray water re-use and treatment: If this water is treated it can be used as a source of water for uses other than drinking. Depending on the type of gray water and its level of treatment, it can be re-used for irrigation and toilet flushing.

Chapter 3 : Water supply network - Wikipedia

Water supply management The water used to supply industrial processes and utilities represents the largest water-related expenditure at an industrial site. Diversifying water resources while securing reliable water supplies contributes to reducing the water footprint of industrial activities.

Find articles by Paul R. MacDonald Find articles by Alan M. Carter Find articles by Richard C. Wrote the first draft of the paper: Contributed to the writing of the paper: Participated in co-author meetings to agree on structure and content of paper; drafted sections of the paper under senior authorship of PRH. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly credited. This article has been cited by other articles in PMC. Summary Points A safe, reliable, affordable, and easily accessible water supply is essential for good health, but for several decades almost 1 billion people in developing countries have lacked access to such a supply. A poor water supply impacts health by causing acute infectious diarrhoea, repeat or chronic diarrhoea episodes, and nondiarrhoeal disease, which can arise from chemical species such as arsenic and fluoride. It can also affect health by limiting productivity and the maintenance of personal hygiene. Reasons for the limited progress towards universal access to an adequate water supply include high population growth rates in developing countries, insufficient rates of capital investment, difficulties in appropriately developing local water resources, and the ineffectiveness of institutions mandated to manage water supplies in urban areas or to support community management in rural areas. Strenuous efforts must be made to improve access to safe and sustainable water supplies in developing countries, and, given the health burden on the public and the costs to the health system, health professionals should join with others in demanding accelerated progress towards global access to safe water. This is one article in a four-part PLoS Medicine series on water and sanitation. Introduction A safe, reliable, affordable, and easily accessible water supply is essential for good health. Yet, for several decades, about a billion people in developing countries have not had a safe and sustainable water supply. It has been estimated that a minimum of 7. This domestic water consumption is dwarfed by the demands of agriculture and ecosystems, even in wealthy countries where per capita domestic water consumption greatly exceeds these figures [2]. To cover all these requirements and to avoid water stress, experts generally agree that about 1, cubic metres of freshwater per capita per year is needed [3]. In particular, it underpins MDG4, the reduction of child mortality, because many deaths in young children in developing countries are due to diarrhoeal disease, and unsafe water is a key risk factor for diarrhoeal disease in this age group [5]. In poorly served countries, achieving the MDG water supply target will involve increasing water availability for domestic uses, improving water quality, and bringing about changed water-use and water-management habits. In the wealthy countries where adequate quantities of domestic water are already available on demand, the main task over the next few years will be to sustain water quality given the increasing pressures of pollution. However, global water supply targets need to be tempered by a recognition of the real demand as expressed in user willingness and ability to pay , which may be less ambitious than the internationally agreed target. Furthermore, account needs to be taken of the realities of frequently poor levels of functionality. It is relatively easy to increase coverage through construction of water supply systems, but it is much more difficult to ensure that such systems continue to provide service over the long term. We therefore argue in this paper for a serious commitment by national governments and their partners to ensure adequate water supply services for all the MDG target, if met, would still leave million people with an unimproved supply [6] , [8]. In addition, we call for increased attention to be paid to ensuring continuing service provision. This will mean finding new ways to enhance public demand for improved services that might translate into a willingness to pay , and a public and private sector ethos that puts high value on the quality of construction and ongoing service delivery. Water Supply and Health Inadequacies in water supply affect health adversely both directly and indirectly Box 1 and below. An inadequate water supply also prevents good sanitation and hygiene. Consequently, improvements in various aspects of water supply represent important opportunities to enhance public health. Box 2 lists six attributes of domestic water supply that determine whether it is effective in the preservation of good health [14]. Although there have been suggested improvements since [10] , none have gained as much recognition as the original system, probably because they are less focused on disease transmission mechanisms.

Chapter 4 : Topic List: Water Supply and Management - Water Education Foundation

Water management is the control and movement of water resources to minimize damage to life and property and to maximize efficient beneficial use. Good water management of dams and levees reduces the risk of harm due to flooding.

Jul 29, RMSs have multiple potential benefits and each area of California needs to select the right mix of strategies to achieve their intended outcomes. Actual RMS benefits depend on how the strategies are implemented. Jul 29, Publish Date: Jul 29, This narrative highlights a variety of water management strategies that can potentially generate benefits that meet one or more water management objectives, such as water supply augmentation or water quality enhancements. However, these management strategies have limited capacity to strategically address longterm regional water planning needs. These are unique strategies and do not fit into the other classified strategies. Jul 29, The agricultural water use efficiency strategy describes the use and application of scientific processes to control agricultural water delivery and use to achieve a beneficial outcome. Jul 29, This flood management strategy provides local and regional water managers a broader perspective of the flood management tools that are available and their interrelationships within one report. Jul 29, Conveyance provides for the movement of water, geographically connecting the supply to the demand. Regional and local water supply conveyance is discussed in this resource management strategy report. Jul 29, System reoperation in the context of water resources means changing existing operation and management procedures for a water resources system consisting of supply and conveyance facilities and end user demands with the goal of increasing desired benefits from the system. Jul 29, Water transfers are a form of flexible system reoperation linked to many other water management strategies, including surface water and groundwater storage, conjunctive management, conveyance efficiency, water use efficiency, water quality improvements, and planned crop shifting or crop idling for the specific purpose of transferring water Conjunctive Management and Groundwater PDF Revision Date: Jul 29, Conjunctive management or conjunctive use refers to the coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives. Surface water and groundwater resources typically differ significantly in their availability, quality, management needs, and development and use costs. Managing both resources together, rather than in isolation, allows water managers to use the advantages of both resources for maximum benefit. Jul 29, Municipal recycled water benefits the state and individual water users by reducing long-distance water conveyance needs, providing local water supplies, and being a drought-resistant resource. This resource management strategy report will describe the current status of recycled water in California, what some of the challenges are to its increasing use, and the resources needed to continue to increase municipal recycled water use. Jul 29, Surface storage is the term for the use of human-made, above-ground reservoirs to collect water for later release when needed. Surface storage has played a key role in California where the quantity, timing, and location of water demand frequently does not match the natural water supply availability. This strategy focuses on statewide options. This strategy focuses on regional and local options. Jul 29, Providing a reliable supply of safe drinking water is the primary goal of public water systems in California. To achieve this goal, public water systems must develop and maintain adequate water treatment and distribution facilities. Jul 29, Groundwater remediation removes constituents, hereafter called contaminants, which affect beneficial use of groundwater. Groundwater remediation systems can employ passive or active methods to remove contaminants. Jul 29, Matching water quality to use is a management strategy that recognizes that not all water uses require the same water quality. One common measure of water quality is its suitability for an intended use; a water quality constituent often is only considered a contaminant when that constituent adversely affects the intended use of the water. Jul 29, Salinity management not only reduces salt loads that impact a region, it is also a key component of securing, maintaining, and recovering usable water supplies. Salt is ubiquitous throughout the environment and it is a conservative constituent meaning it is never destroyed, just concentrated or diluted and transported. Jul 29, Urban stormwater runoff management is a broad series of activities to manage both stormwater and dryweather runoff.

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Chapter 6 : Water Supply Assessments | Northwest Florida Water Management District

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Chapter 7 : Water Supply | Westlands Water District

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The staff works to ensure that the information necessary to support resource management decisions and water supply planning activities, assess groundwater availability, facilitate drought monitoring, and support the expansion or creation of groundwater management areas is available.