Case Study:

Expansion of Lifeline Services in Colorado Springs, CO

Participant Guide

Disclaimer: While this case study uses actual system data available from Colorado Springs Utilities, the scenario is completely fictional. Beyond the use of this data, no actual persons, organizations, entities, or project proposals are used.

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Abstract

Students, by virtue of the fact they have used the infrastructure their entire lives, are familiar with it. Many, however, struggle to define, describe, and explain it, particularly if they have to do it concisely and for audiences with different levels of knowledge. This challenge is particularly problematic because problem solving methodologies begin by understanding, visualizing, and describing the current state of the system. This case study is an exercise in describing and assessing the current state of three lifeline infrastructures in Colorado Springs, Colorado. The goal of the exercise is not to produce a fully complete description of the Colorado Springs infrastructure, but rather to reduce a very large amount of data to a manageable and meaningful description of the system. Once described, the students will assess the Demand/Capacity ratio of each infrastructure. While the case study is placed in the context of a discussion in infrastructure expansion, the students focus on describing and assessing the current state of the infrastructure, not planning the expansion.

Colorado Springs, CO was selected as the target community because it is a metropolitan region that is large enough to challenge the students but not so large as to overwhelm them. Additionally, there are many regions of similar size that face similar challenges throughout the nation so it provides a classroom exercise that prepares them for something they might actually do after graduation. Finally, sufficient information is available in an appropriate format to support the case study. The same case study could be adapted to any city or metropolitan area by simply changing out the reference data and changing the script to reflect the new location.

Case Study Objectives

1. Use the Component Model as a framework for understanding, visualizing, and describing the electric, water, and wastewater infrastructures in a metropolitan region.

2. Assess the current demand/capacity ratios of these infrastructures and quantify the capacity to support growth given the existing system.

3. Present a description of these infrastructures that is technically correct, useful for facilitating discussions on system expansion, and accessible to all audiences.

References

Preparatory Reading (Please read this article before coming to class for the case study. It introduces and explains the Component and Assessment Models which are used in the case study.)

Reading 1: Hart, S. D., Klosky, J. L., & Katalenich, S. (2013). Conceptual Models for Infrastructure Leadership. *Jounal of Management in Engineeering*.

Technical References (Please familiarize yourself with these references from Colorado Springs as they provide the technical data which will be used in each of the case study steps.)

Reference 1: Pikes Peak Area Council of Governments (2008). Public Utilities and Infrastructure Technical Report: Fort Carson Regional Growth Plan.

Reference 2: American Society of Civil Engineers, Colorado Section (2010). Colorado Infrastructure Report Card.

Reference 3: Colorado Springs Utilities (2012). Electric Integrated Resource Plan.

Reference 4: Colorado Springs Utilities (2012). Water Tour.

Reference 5: Colorado Springs Utilities (2008). Waste Water Integrated Master Plan.

Reference 6: Colorado Springs Utilities Web page: https://www.csu.org/Pages/default.aspx Click on the "Residential" or "Business" tabs at the top of the page, then on the "About Us" tab for some useful information.

Note: the publication date on these references vary, but for purposes of this case study, consider all of them to be current.

Introduction

Infrastructure exists to provide a function that society needs to survive, thrive, and grow. This function, like everything else in life, does not happen without significant effort and does not come for free. For example the water, wastewater, and electricity are lifeline services that allow the American way of life to thrive. For these services and the related infrastructure (power stations, pipelines, treatment plants) to exist in the community, someone owns it, someone operates it, someone maintains it, someone uses it, and someone pays for it. Considering that none of these functions are done by the same groups of people gives some sense of the variety of stakeholders involved in sustaining the infrastructure: owners, operators, governments, regulators, customers, taxpayers, non-profits, leaders and other influential people in the community, urban planners, lawyers, and engineers.

The challenge of communicating across a highly diverse group of infrastructure stakeholders was addressed in Conceptual Models for Infrastructure Leadership (Hart, Klosky, & Katalenich, 2013) which proposed a family of infrastructure models as a "universal framework for understanding, visualizing, and describing complex infrastructure systems in a manner that facilitates communication, fosters participation in infrastructure decisions, and allows engagement with design processes, significantly improving the odds that a project will be successful."

This case study is an exercise in understanding, visualizing, and describing the water, electrical, and wastewater infrastructures for a mid-sized metropolitan area for the purpose of community discussions on the future of these systems. Participants will use the Infrastructure Component and Assessment Models recommended by Hart, Klosky, and Katalenich as well as information provided by the local utilities to prepare a presentation based on the scenario provided.

It is recommended that the class divide into teams with each team working on one infrastructure. The case study concludes with presentation on the water, wastewater, and electrical infrastructures of Colorado Springs and a class discussion on the process.

Case Study Scenario

Spurred by a proposal from the Governor of Colorado to create the Colorado Technology Cluster (CTC), a conglomeration of twelve major high-tech corporations is considering relocating their combined manufacturing operations to the Colorado Springs metropolitan area. This move will substantially increase the population, provide new jobs and new opportunities, boost both home and commercial construction, and increase the tax base. The Institute for Urban Planning and Development at High Plains University estimates that this development will result in a 25% increase in demand for the water, electrical, and waste water infrastructures in the Colorado Springs metropolitan area. Public opinion is divided on the issue with perspectives ranging from "Support Smart Growth" to "Keep The West Wild and Free—Horses not Hard Drives!" Though there are disagreements, the local citizens remain on good terms with each other and are striving to keep the debate very civil and focused on the facts.

Accordingly, the Institute for Urban Planning is convening a two day forum called "Forging our Future-High Tech on the High Plains" to foster community discussion on this complicated issue. The morning of the first day will be dedicated to "Just the Facts…A Discussion of the Current State of the Pikes Peak Region." The local Chamber of Commerce and the local chapter of the American Society of Civil Engineers have partnered to give a 30 minute presentation on "Water-Wastewater -Electricity: A Status Report on Essential Services." You have volunteered to serve on the committee that will develop the presentation.

The co-chairs of your committee are Inga Neer, a noted local civil engineer, and I. B. Rich, president of the Pikes Peak National Bank. Inga and I.B. have proposed the committee divide into three groups, each focused on one of the three lifeline services. The committee has obtained several reports on the infrastructure from Colorado Springs Utilities that will support the work of each task group. Inga and I.B. have asked each group to use the infrastructure component model (Hart, Klosky, & Katalenich, 2013) to reduce these technical reports to a four slide (or fewer) descriptive presentation of each infrastructure that is informative, technically correct, and accessible to any audience.

After describing the infrastructure using the Component Model's six functions (Generation, Bulk Transmission, Distribution, Use, Waste Management, and Cooordination), Inga and I.B. would also like each group to look at the demand/capacity ratio of each function. This will involve considering the 'required' and 'ready' prompts of the infrastructure assessment model (the other prompts are organized, tough, redundant, and prepared). When the demand/capacity ratios are considered, can the existing infrastructure support a 25-percent expansion? Each task group will summarize this information on a fifth slide.

When the committee's work is complete, Inga and I.B. will have 15 slides to be presented in 30 minutes that will describe both the current state of the Colorado Springs area infrastructure and its capacity for expansion.

Case Study Tasks:

Task 1: Organize the Team

Divide the class into three teams to address the three required descriptions. Pay careful attention to team organization and the skills each member brings to the team.

Task 2: Describe the Drinking Water Infrastructure

Use the component model to complete the requested description of the drinking water infrastructure. Use the assessment model to determine the demand/capacity ratio of the water infrastructure, and, if possible, the demand to capacity ratio of the six functions. Prepare the requested presentation and present it as part of the team.

Task 3: Describe the Wastewater Infrastructure

Use the component model to complete the requested description of the wastewater infrastructure. Use the assessment model to determine the demand/capacity ratio of the wastewater infrastructure, and, if possible, the demand to capacity ratio of the six functions. Prepare the requested presentation and present it as part of the team.

Task 4: Describe the Electrical Infrastructure

Use the component model to complete the requested description of the electrical infrastructure. Use the assessment model to determine the demand/capacity ratio of the electrical infrastructure, and, if possible, the demand to capacity ratio of the six functions. Prepare the requested presentation and present it as part of the team.

Task 5: Prepare and give the "Water-Wastewater &Electricity: A Status Report on Essential Services" Presentation

Assemble the three presentations into a 15 slide presentation and give this presentation to the class.

Task 6: Discussion and Conclusion.

Discuss the results of the case study, the level to which students met the lesson objectives, the ease or difficulty in assembling the requested information, and the effectiveness of the presentation. Students should also asses their level of understanding of the complexity of sustaining and increasing the capacity of lifeline infrastructure.