DEMONSTRATING THE ECONOMIC BENEFITS OF INTEGRATED GREEN INFRASTRUCTURE

EXECUTIVE SUMMARY

INTRODUCTION

It is a widely held opinion that protecting the environment and sustaining a high quality of life results in higher short and long-term costs. There is growing evidence, however, that strategies and technologies supportive of these ideals are both technically and financially viable and deliver higher quality, more efficient and environmentally beneficial services at lower cost than current, conventional approaches.

In addition, many scientists, economists and planners have recognized that integrated approaches to problem solving lead to more efficient, lower cost solutions, and when developed with natural principles and elements in mind, improve the triple bottom line even further.

This study examines how such an integrated decision making approach for municipal infrastructure, especially when employing natural elements, can deliver tremendous social, economic and environmental benefits as well as significant short and long-term cost-savings for municipal infrastructure and municipal governments.

TYPES OF GREEN INFRASTRUCTURE INTEGRATIONS

Most municipalities currently make infrastructure decisions in a departmental manner. This structure inhibits or prevents full lateral dialogue and thus fully integrated decision-making. The integrated design approach, where numerous disciplines work in parallel, has already demonstrated much success in building design, industrial ecology analysis and ecosystem planning and promises similar benefits if applied to the municipal decision making process as well.

To help facilitate an understanding of how to apply this integrated approach the study begins by identifying eight types of green infrastructure integrations that could be developed by multiple departments working together.

The identified integration possibilities were:

- Inclusion of demand side management and efficiency measures into ALL planning
- Identification of multiple functions which could be implemented in single devices

- Identification of secondary resource values available in all services
- Examination of siting and placement of compatible services
- Creation of social amenities as intrinsic attributes of hard infrastructure services
- Matching of resources to end use requirements
- Engagement of natural (biological and passive) functioning in service provision
- Strengthening local resilience to external and internal disruptions.

The study details what is meant by each of these forms of integration and illustrates them with examples of where they have been implemented. In addition the study supplies an analytical matrix that can be used by municipalities to identify where services can be integrated with one another.

STUDY APPROACH

The study uses a combination of existing and projected scenarios to illustrate various integration approaches and to identify their cost benefits.

STAGE ONE details four existing Canadian solutions and outlines two European examples.

1) TORONTO DEEP LAKE WATER COOLING

This project was a private/public partnership whereby the city integrated a district cooling system with its potable water system. The study shows how the private sector shared in the municipal infrastructure costs, allowing the city to obtain a $55M water intake at no cost. The study notes how the municipality receives ongoing revenue by selling the coldness of the water (but not the water itself), how the city now has lower operating costs and that the project saves over 45,000 MWh/year in electrical production. The project significantly lowers GHG and CFC emissions; created thousands of person years of employment, lowers costs for downtown business operations, reduces noise and provides better quality drinking water sources.

2) EDMONTON INTEGRATED WASTE MANAGEMENT SYSTEM

This project used two major public/private partnerships in combination with public education and recycling (demand management) programs to achieve one of the highest waste diversion rates in Canada. This was accomplished in a manner that was cost neutral to the city over thirty years. Major facilities now create 80,000 tonnes of marketable compost/year, sufficient methane to generate electricity for 4000 homes, a centre of excellence for further waste and wastewater treatment research and an electronics and metals recycling plant.

3) VANCOUVER/DELTA LANDFILL GAS UTILIZATION PROJECT

Vancouver wished to increase its usage of landfill gas and so brought in a private partner to construct a 2.5 km pipeline from its Delta landfill to a specific user (a multi acre tomato greenhouse operation). The greenhouse operation constructed a co-generator to gain both heat and power, using this lower cost, non fossil fuel source and to return unneeded electricity to the grid. The city now receives a profit from the sale of the gas, the greenhouses use a cleaner and cheaper source of

fuel, GHG emissions from the landfill site are significantly reduced and the host city of Delta receives increased property taxes.

4) HAINES JUNCTION GEOTHERMAL DISTRICT HEATING SYSTEM

This small (800 pop.) Yukon community has developed a joint venture with the Energy Solutions centre in Whitehorse to develop a combined potable water and community heating system, energized by a warm water artesian source it discovered while drilling a water well. The proposed system has the potential to remove the entire community from fossil fuels, to provide a revenue stream to the municipality itself and to deliver a much more reliable and far cleaner form of heating at a 25% reduction in costs to residents who have to do nothing to receive this benefit.

HAMMARBY JOSTAD'S WASTE TO ENERGY AND BEDZED'S INTEGRATED WATER MANAGEMENT PROJECTS

Brief outlines of these two advanced European projects demonstrate even more sophisticated integration examples and lay a foundation for stage two of the study.

STAGE TWO builds from stage one by combining the successes and lessons learned from the Canadian examples with the demonstrated sophistication of the European examples to develop and cost a much more comprehensive Canadian scenario than that which has been built to date.

The projected scenario, is based on a real 28 Ha urban redevelopment project which has just entered the planning stage. The costing approach used by the study to analyze this scenario employs a life cycle analysis based on a 75 year time frame to calculate savings over 10 years.

The study creates three integrated green infrastructure clusters for analysis:

A) Transportation and Conveyance, a scenario that explains ways in which fully excavated below ground parking can provide optimum integrations with servicing access, municipal solid waste management and pedestrian walkway systems.

B) Water, Wastewater and Stormwater, a scenario which illustrates reductions in potable water usage resulting from greywater and blackwater separation systems, water conservation and reuses and on-site storm water management.

C) Energy, a scenario that identifies optimum results when district energy systems and energy efficient buildings are designed in parallel.

For each cluster the study details the synergies involved, internal and external cost savings, cost offsets and a description of the infrastructure components, including their natural attributes.

The cost/benefit analysis of these clusters demonstrates an accumulated cost savings of over $66M in the first ten years directly attributable to integration of infrastructure in these three clusters.

OVERALL FINDINGS AND CONCLUSIONS

The study demonstrates that integrated green infrastructure has the potential to transform municipal infrastructure developments to the point where they not only cease to be the burden and cost drain they usually are currently, to where they can add high economic, social and environmental value at lower cost and become revenue sources as well.

It notes that there are still a number of significant institutional barriers to be dealt with to achieve this added value and that these barriers include the creation of interdependent planning and budget processes, taxation and policy reform, revised fee structures, the creation and implementation of full cost accounting models and the optimization of private /public partnerships.

The study concludes by noting that while a number of Canadian municipalities already benefit from certain green integrated infrastructure solutions there is still an enormous untapped potential for more such solutions and that the challenge now is to develop comprehensive technologies, solutions and funding formulas which work. It notes that the implementation of advanced systems in Europe and elsewhere indicates that integrated green infrastructure has become a recognized global shift in community design direction which offers tremendous potential for significant cost reductions, environmental social and economic benefits and thus is a direction which not only cannot be ignored but which should be pursued.