

EFFECTS OF CONSTRUCTION ON COMMUNITIES

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Abstract

This paper discusses the effects of construction on the community and the human environment. The paper also investigates the ill as well as the positive effects of a construction project on the surrounding region. The various adverse effects such as air quality, noise pollution, traffic disruption, land contamination and positive aspects such as job creation and improved standard of living are presented. Utilizing a case study, the effects of construction of super stores is taken into consideration in order to analyze their effects on the community.

Introduction

The Environment comprises those aspects of human health including quality of life that are determined by physical, chemical, biological, social, and psychosocial factors. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially adversely affect the health of present and future generations. Human beings interact to a greater or lesser extent with all aspects of the environment and thus, impacts on any aspect of the environment has the potential to impact human beings. The impacts due to construction related to human beings are the socio-economic impact, which includes traffic, air quality, noise and vibration, and landscape and visual effects. Construction affects the community adversely as well as in a positive manner. The present paper discusses these affects and also the remedies to prevent or eliminate these problems.

Some of the basic concepts in this paper were discussed in an elective course at Lamar University involving building design and construction. Students, who are interested in a

particular topic may continue their studies in this area and enroll in an independent study class of variable credit and perform additional research on this topic. Specifically, the information in this presentation has been taken, in part, from papers written by three students and combined by the first author.

Adverse effects on the community

Environment: Wastes associated with construction include unused and excess material generated during site excavation, site clearance, construction, and renovation activities. These wastes may be rubble such as concrete, bricks and asphalt, wood and wood products, plaster, metals, plastics, and insulation. These materials commonly referred to as Construction and Demolition (C&D) debris comprise approximately 15 to 30 percent of all waste disposed of in landfills. In addition, purchasing decisions associated with the construction projects can affect the amounts of waste generated, as well future energy requirements¹.

Air quality: Construction projects can have a significant impact on indoor environmental quality (IEQ) through the introduction of pollutants such as particulates, offensive odors, toxic chemical vapors, microbial, and combustion products⁵. The quality of air may deteriorate, in part, due to the dusts and odors produced from:

- Materials being demolished for the construction purpose
- Products used in construction
- Equipment used in construction.

The transportation of construction materials and earth moving operations can produce a significant quantity of dust. The amount of dust generated is related to the quantity of material moved, the number of vehicular movements, climate, and local factors such as moisture and silt content of the soil¹. Pre-planning efforts that anticipate these issues and specify adequate pollutant control methods should be used prior to commencing work to minimize these problems.

Noise pollution: Noise pollution or sound pollution is related to the exposure of people or animals to levels of sound that can be annoying, stressful, or damaging to the ears. Although loud and frightening sounds are part of nature, only recently has much of the world become urban, industrial, and chronically noisy mainly due to the immense growth in industry, including that of construction.

Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic; industries; construction and public work; and the neighborhood.

Building construction and earth works are activities that can cause considerable noise pollution. The increasing ambient noise levels in public places from construction projects may have a deleterious effect on human health and the psychological well being of people. Also, farm machines, and the noise of equipment inside factories can be dangerously loud. A variety of sounds are present from cranes, concrete mixers, welding, pile driving, boring, and other work processes. Construction equipment is often poorly silenced and maintained, and building operations are sometimes carried out without considering the environmental noise consequences. In addition, community services such as garbage disposal and street cleaning can cause considerable disturbance if carried out at sensitive times of day⁷.

In the community, as shown in Table 1, 40% of the population is exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dB(A) daytime, and 20% are exposed to levels exceeding 65 dB(A). Noise pollution emitted during the process of construction is severe in cities of developing countries¹⁵.

In contrast to many other environmental problems, noise pollution continues to grow and is accompanied by an increasing number of complaints from people exposed to the noise. The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects. It also adversely affects future generations, and has socio-cultural, esthetic and economic effects¹⁵.

Most hearing loss occurs in workplaces, where workers may be unable to avoid unhealthy noise levels, and where exposure may continue for years. Construction workers may also have reason to be concerned about their occupational exposure to noise⁵.

Table 1: Guidelines for noise levels (dB) in specific environments¹⁵:

Specific environment	Critical health effect(s)	dB	Time base [hours]
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Dwelling, indoors	Speech intelligibility and moderate	35	16

School class rooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	during class
Hospital, ward rooms, indoors	Sleep disturbance, night-time	30	8
	Sleep disturbance, daytime and evenings	30	16
Industrial, commercial shopping and traffic areas, indoors and outdoors	Hearing impairment	70	24

Water pollution: Water pollution has the potential to arise at numerous construction sites. During construction, there are a number of pathways by which pollutants can enter surface and ground waters. These include site runoff, dewatering operations, and direct input. The potential impacts on the surface water environment are also greater when construction work is within or adjacent to a watercourse⁵.

At present, there are few pollution mitigation measures, such as oil/water separators installed on the discharge of road drainage systems. Any pollutant on the surface and entering the drainage system would, therefore, be discharged directly into surface waters. Suspended solids are the main pollutant from construction sites, and can result from removal of surface cover including vegetation, stockpiles of imported or excavated materials, and build-up of dust and mud deposits on haul roads⁴. However, silt fences have been found to be effective in controlling the movement of soil from the site.

Traffic Disruption: Disruption of traffic due to construction is a term that covers the effect on people and the natural environment that can occur between the start of pre-construction work and the end of the contract maintenance period. An assessment is often conducted of the various construction activities that can result in disturbance and/or disruption for users of the system. This assessment takes into account potential construction impacts to local residents, workers, and vehicle and non-vehicle travelers arising from noise, vibration, dust, dirt, and changes in travel duration and other amenities.

The assessment also considers potential impacts on the natural environment associated with drainage, accidental spillage, dust generation, and temporary short term visual impacts due to project work⁸.

It may be that a construction project requires the use of a temporary traffic management system, which could include speed restrictions, narrow lanes, use of hard shoulders, and contra flows. This impact may be most significant in terms of the human environment due to the temporary decrease in journey amenities; however, there may also be some adverse impact on the natural environment. The imposition of lane restrictions can increase congestion, particularly during the peak hours. This could have detrimental impacts on the immediate roadside air quality due to the higher polluting potential of vehicles under stop/start driving conditions

Land Contamination and Ecosystem: The clearing of land for construction can lead to the loss of wildlife habitats, erosion, and sedimentation problems associated with the use of heavy machinery, loss of native plant life, and contamination of soils, in addition to surface and groundwater systems. During excavation, any contaminated soils encountered must be carefully controlled to avoid human contact or the movement of pollutants into uncontaminated areas³. This is particularly important where activities occur adjacent to sensitive areas, such as watercourses or agricultural land. Appropriate measures should be incorporated within the construction contract to mitigate adverse impacts associated with intentional or accidental disturbance of contaminated soils.

In some regions, there are areas of woodland, including ancient trees that may, potentially, be destroyed during construction operations. Working constraints should be enforced to protect these sites during construction that may include⁴:

- Placing restrictions on borrow or surplus storage sites within the boundary of the project.
- Erecting fencing to limit accidental encroachment onto ecologically sensitive areas.
- Preventing access of construction traffic.

Natural resource destruction: People rely on farmland to provide for their basic needs, including food, shelter, and clothing. Farmland also competes for the space occupied by natural habitats. Population growth and human development, therefore, both directly and indirectly effects the biodiversity in a region⁴.

Construction work due to population growth has increased deforestation and decreased farmland for housing and other requirements such as energy generation and industrial development. Developed areas support few animal species and experience a sharp decrease in biodiversity through the destruction of natural habitats. In addition, areas in

the vicinity of construction work may be affected by long-term damage due to construction wastes that are not properly removed³.

Positive aspects of construction

Job creation: The construction industry has been a leading source of job growth in the United States over the last decade, averaging 2.9 percent throughout the 1990's and increasing to 7 percent in 2000. Symptomatic to the sluggish economy, employment in the industry has slowed significantly over the past several years, and actually underwent a constriction in 2001 and 2002. Long-term forecasts, however, predict continued growth in construction employment through the next decade due to a pick-up in the economy and an increase in large public projects. Construction jobs are generally an excellent source of income. As an example, over 80 percent of all jobs in the industry and 67 percent of entry-level jobs pay a living wage. Given the present and projected increase in real estate transactions, robust growth job opportunities with private engineering, construction, architectural, and management services firms are expected.

The construction industry, with 6.7 million wage and salary jobs and 1.6 million self-employed and unpaid family non-government jobs in 2002, was one of the Nation's largest industries. Around 1 out of 4 jobs were with building contractors, mostly in residential and nonresidential construction. The rest were with heavy and civil engineering construction contractors. Employment in this industry is distributed geographically in much the same way as the Nation's population; the concentration of employment is generally in industrialized and heavily populated areas¹⁶.

There were about 792,000 construction companies in the United States in 2002: 237,000 were building construction contractors; 60,000 were heavy and civil engineering construction or highway contractors; and 496,000 were specialty trade contractors¹⁷. Employment in heavy and civil engineering construction is projected to increase due to growth in highway, bridge, and street construction, as well as in maintenance and repairs to prevent further deterioration of the Nation's highways and bridges.

Economy: In 2003, the construction sector grew by approximately 11 percent. This large increase was mainly accounted for by increased construction of residential buildings, primary schools, highways and various utilities. The growth of the construction sector is often attributed to the direct spending by the government on power, water supply, highways, and maintenance/ rehabilitation projects⁹.

Socio economic benefits: The construction industry generally enhances prospects for economic development in specific regions of the country and it may also stimulate

increased tourist activity, and improved accessibility to recreational and cultural facilities. In addition, neighbouring properties may possibly be greatly enhanced along with improvement in amenities and overall increased safety conditions on highway systems.

Improvement in Living Conditions: It is believed that the construction industry generally increases the standard of living of a society. Rising living standards may be measured by positive changes in housing, transportation and communications, education, and recreation facilities. Housing maybe upgraded in practicality, comfort, and style. Infrastructure construction could involve new highway systems. Due to higher living standards and economic growth, both indoor entertainment and outdoor recreational activities will increase enhancing tourism and improving the economy in specific regions⁶.

Remedies to minimize or eliminate environmental effects

- Avoid construction in environmentally sensitive areas such as wetlands and threatened or endangered species habitats¹⁰.
- Construction contracts must specify that contractors should be restricted to the least possible disturbance to a site's vegetation. For example, under certain circumstances it may be possible to preserve individual trees or stands of old-growth timber that would otherwise be destroyed².
- Preplanning efforts are to be made to reduce the use of materials with constituents that can negatively affect the environment.
- Architectural plans should call for sufficient insulation to reduce heat loss and conserve energy.
- State and city Governments should categorize regions into industrial, commercial, residential, or silent areas/zones for the purpose of implementation of noise standards for different areas⁷.
- Environmentally sound purchasing decisions should be required to prevent pollution and reduce the amount of waste generated by a building/housing construction project⁵.
- Reuse and recycling of appropriate products made from waste materials generated as a result of building/housing construction. The benefit of these practices is that materials that would otherwise be disposed of in the waste stream are diverted for productive uses⁵.
- Employing energy efficient technologies and practices can have a significant positive effect on the environment. There are a number of opportunities for architects to include energy efficiency in various facilities⁵.
- Appropriate measures should be incorporated within the construction contract to mitigate adverse impacts associated with intentional or accidental disturbance of contaminated soils⁷.

Construction of a super store in a community

Super centers are huge one stop facilities that combine retail, groceries and miscellaneous other services. Super centers have been deemed as the fastest growing type of stores in the United States. Wal-Mart, Kmart, and Target are some of the kings of super centers. When rumors that a super center may be located in an area begin to circulate, various positive and negative concepts tend to surface. According to many, the construction of a super store will have both advantages and disadvantages for a community. Some of these factors are as follows:

- Existing small businesses will suffer. Super stores have a combination of low prices, plentiful parking space and one stop shopping which is an advantage for customers.
- The huge space requirement necessary for the construction of a superstore can lead to the destruction of vegetation and land contamination.
- Traffic may become congested during construction and later due to the large number of shoppers.
- There should be more job opportunities.
- Large stores tend to attract additional economic development.
- There will be an increase in the tax revenue, which promotes economic development.
- Super centers are attractive as they offer one stop shopping which will reduce the travel time of the people.

Therefore, whether a superstore is a friend or a foe to an area depends on the specific interests of a community.

Wal-Mart

This section discusses the effects of a new construction project on the job creation process in a community. For this purpose, a case study of employment opportunities due to the construction of a Wal-Mart store is considered. Wal-Mart has created more jobs in the 1990s than any other company in the country¹¹. It is one of the major firms contributing to the nation's economy. Hence, opening a Wal-Mart store should, therefore, impact on the job creation process in a community.

Sam Walton, the founder of Wal-Mart, opened the first Wal-Mart store in Rogers, Arkansas in 1962. By the time the company went in public in 1969, it had 18 stores throughout Arkansas, Missouri, and Oklahoma. The company is publicly traded on the New York stock Exchange under the symbol WMT and has its headquarters in Bentonville, Arkansas. At first the company slowly expanded its geographical reach, building new stores and accompanying distribution centers further and further away from

its original location. In addition, the firm, continued to build new stores in areas already serviced by existing facilities. By 1998, Wal-Mart had approximately 2400 stores in all 50 states and about 800,000 employees in the United States¹². Today, the company is the largest retailer in both the U.S and the world, and currently has a presence in 10 countries. Wal-Mart operates discount stores as well as “Super centers” which include grocery departments and constitute approximately one third of all current facilities.

Recently, Wal-Mart had revenues of \$191 billion. Wal-Mart's 2002 sales topped \$218 billion, with sales growth at 13.8 %. Its 2002 net income was \$ 6.7 billion, a growth of 6 % increasing the economy of the country to a great extent. It has 1,283,000 employees and is one of the largest merchandise employers in the world¹⁹. Wal-Mart is also expanding as a retailer. They have expanded into many other sectors of the marketplace, including groceries, gas stations, electronics, and auto maintenance.

Employment Opportunities: The typical Wal-Mart store is 100,000- 150,000 square feet and employs 150- 350 people, many in part- time jobs. However, super centers employ 400- 500 workers and tend to be larger in size. In the fiscal year ending January 31, 2001, Wal-Mart experienced \$ 191 billion in sales¹¹. It currently employs over 1 million people in the United States at 3,300 stores and operates 4,500 retail units in 10 countries: the United States, Mexico, Puerto Rico, Canada, Argentina, Brazil, China, Korea, Germany, and the United Kingdom (where it owns the ASDA chain of supermarkets). As mentioned previously, Wal-Mart “created more jobs in the 1990s than any other company”¹³.

The stores sell a broad range of products such as clothes, consumer electronics, drugs, outdoor equipment, guns, toys, hardware, CDs and books. Its typical products are basic mass produced inexpensive items, rather than premium products stocked at specialist stores¹². It has been found that the opening of a Wal-Mart store in an area provides employment opportunities to the local residents in the following fields:

- Pharmacy
- Information Systems
- Optometry
- Lube and Tire servicing
- Shoes and Jewelry
- Electronics
- Merchandising
- Finance

Advantages/ Disadvantages: There are numerous advantages and disadvantages to a community associated with the opening of a Wal-Mart store in an area¹³. Some advantages include:

- Increased sales tax revenue
- Increased real estate tax revenue
- Increased employment
- Place where those with minimal means can shop
- Approximate effect of income multiplier^{18, 20} (1.65)
- Establishment of restaurants in areas
- Concept of “green building” construction

Disadvantages include the following:

- Loss of small business
- Low quality goods
- Traffic congestion
- Noise pollution
- Impact of monopoly

Opposition: In the numerous communities there has been sharp opposition to the establishment of a Wal-Mart presence in the region. This was the case when Wal-Mart announced its plans to open branches in two historic communities of Vermont, Bennington and Rutland¹⁴. The reason for the opposition was basically related to the fact that these communities wished to preserve their historic downtowns. These areas contain the economic center of the city as well historical districts, which tend to be a great source of employment related to the tourist industry. After much discussion, it was decided to locate the Wal-Mart store in non-sprawl areas, yet close enough to the historic downtown areas to reinforce retail sales for existing merchants.

Summary and conclusions

Overall, there are numerous positive and negative effects of construction such as:

- Traffic may be disrupted. This results in the increased travel time for the people in the community to reach their destination.
- Increased air pollution, noise pollution, and water pollution.
- Land contamination during earthwork excavations, and loss of vegetation may occur during a project.
- The economy can increase with the growth in the construction sector.
- It could be beneficial for the employment and the wages of workers living in the community.
- The standard of living may increase due to the jobs created by the construction work.

Hence, we can conclude that a new construction project can have both positive as well as negative impacts on a community. Therefore, it is necessary to keep in view the importance of the project to the region and quickly initiate planning activities. These should involve adopting remedial measures in order to ensure a healthy environment during and after construction operations.

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