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A Student Perspective on Environmental Planning for Mysore, India

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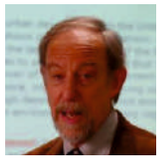
ABSTRACT

This paper summarizes the report of a graduate level workshop that was conducted at the School of Planning, College of Architecture, Art and Planning, University of Cincinnati, USA. The objective of the project was to prepare students to work overseas in data-poor environments as professional consulting planners. The class of eighteen students operated in sector-level working groups to prepare a 5-year plan to solve the urban environmental problems of Mysore, India, utilizing a real-world data base and a limited budget. This project culminated in the preparation of a professional quality plan.



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Introduction

This paper is a case study of Urban Environmental Management (UEM) in developing countries that summarizes the results of a graduate level workshop at the School of Planning, College of Architecture, Art and Planning, University of Cincinnati, USA from August to December 2013. The objective of the workshop was to prepare students to work overseas in data-poor environments as professional consulting planners. The class of eighteen students operated in sector-level working groups to prepare a 5-year plan to solve the urban environmental problems of Mysore, India, utilizing a real-world data base and a limited budget. The seven working groups or sectoral teams (Poverty Alleviation, Industry, Sewage and Solid Waste, Transportation, Energy, Water and Finance) conducted internet and library research and wrote sectoral reports, which were combined to form the Environmental Plan for Mysore (Edelman, 2014).

1. Poverty Alleviation

Problem Statement

The State of Karnataka's poverty rate is estimated at 24.53% . The current population is 920,550 comprising 215,061 households (Mysore City Corporation, n.d.). 225,810 people live below the Government of India defined poverty line (BPL). Moreover, the Mysore City Corporation lists a slum population of 44,486, and while 13% of the Scheduled Caste and Tribe identified population lives in a slum, those individuals make up 50% of the slum population. Slum unemployment is 56% overall, and over 72% of women in the slums are unemployed (Ibid.)

In the 69 slums in Mysore, nearly two-thirds reside in slums with a population of 800 or more (Administrative Staff College of India, 2011). By focusing on these 22 larger slums the allocation of efforts and funds can be optimised to benefit maximum population. For smaller slum size, it is most appropriate to seek a remediation that eliminates the settlement or incorporates it into an adjacent existing neighborhood. In another approach, aggregation of slums in close proximity allowed an addition of three more slums reaching nearly 70% of the total slum population. Direct interventions, therefore, are focused on 25 slums. **(Table 1)**

Programs for Poverty Alleviation

Rather than attempt to relocate the slums, slum redevelopment is recommended. In many cases people who have lived on the land for many generations do not have property rights. However, land ownership is considered important before redeveloping. It is recommended that in Mysore, a partnership be forged with current government interventions, such as the Jawaharlal Nehru National Urban Renewal Mission (JnNURM). JnNURM finished the preparatory phase of its Mysore renovation project, and began the infrastructure phase in June 2013.

According to the Karnataka budget of 2010, the state has set aside US$ 3,194,000, ($1US = appx. 60 Rupees) to build housing for homeless slum families, sufficient only to provide housing to one third of the neediest population (Saral VAT: Complete VAT Solutions for Karnataka, n.d.). It is suggested to supplement the remaining two thirds of this cost to provide shelter for all. Provision of basic needs will result in less dependence on assistance, decreased poverty and increased employment improving the

Ward	Slum Name	POP	HH	BPL POP	BPL HH	%BPL TOT
8	Chinnagirikoppalu	2,163	550	2,163	550	4.6%
9	Nellurushed Part A	866	200	866	200	1.9%
9	Nellurushed Part B**	594	143	580	140	1.2%
6	Ashokapuram 13th Cross	987	202	987	202	2.1%
8	D. Devarajaurs Colony	895	157	895	157	1.9%
28	Part of Kumbarakoppalu* **	525	122	525	122	1.1%
29	MetagalliHarijana Colony & Adhijambava Colony	963	204	963	204	2.1%
29	MetagalliJanata Colony	1,181	290	1,181	290	2.5%
29	Part of Metagalli* **	465	108	465	108	1.0%
30	Manjunathapura	900	190	900	190	1.9%
34	Medhars Block	1,091	289	1,078	285	2.3%
42	BudbudakeriChikkaveranna Road	803	226	794	223	1.7%
42	BudbudakeriPulikeshi Road	1,438	321	1,438	321	3.1%
44	HalimNagara*	882	163	882	163	1.9%
45	EkalavyaNagara*	1,383	353	1,383	353	3.0%
46	Kesare near slaughter house	1,258	285	1,258	285	2.7%
51	Siddappaji Cross Road 1,2,3	881	185	881	185	1.9%
51	Chamundeshvari Road Gandinagara	967	225	967	225	2.1%
51	Siddappaji Cross Block A	1,038	215	1,003	208	2.1%
52	KalyanagiriUsmani Block*	2,067	389	2,067	389	4.4%
56	Sathagalli	2,509	523	2,509	523	5.4%
59	Kyatamaranahalli A.K. Colony	1,781	363	1,781	363	3.8%
59	Gousiya Form House*	1,730	357	1,730	357	3.7%
59	Gousiyanagara A Block*	3,657	730	3,657	730	7.8%
62	Jyothinagara	1,278	212	1,025	174	2.2%
	Totals	**32,302**	**7,002**	**31,978**	**6,947**	**68.4%**
	Percent Overall	**69.1%**	**67.5%**			

** Designate Non-notified Slums; ** Designate Adjacent Slums*

Table 1: Slums for Direct Alleviation
Source: Administrative Staff College of India, 2011.

overall worth of the city. Existing housing programs be supplemented financially by providing US$ 2,000,000 in the first year, allowing the existing NGOs working in these areas to continue their work while meeting the overall goal of providing housing for the poor population of Mysore. An additional amount of US$ 1,250,000 will be given each year thereafter for four years. At the end of the five-year period, it is expected that 15,000 family dwellings will have been developed, with the land tenure rights provided to the families residing on the land.

Community and Sack Gardens

In India, malnutrition, vitamin and mineral deficiencies play a very large role in children's underdevelopment. To counter these deficiencies in the slums, it is recommended to provide for leafy green gardens as described below which can grow in resilient conditions and shallow soils.

Keyhole Gardens

It is recommended to install a type of garden developed by TECA called a “keyhole” garden **(Figure 1).** Keyhole gardens require little labour and water and no fertilizers or pesticides while

growing five varieties of vegetables to feed a family of 8 persons. They act like an organic recycling tank, using food and garden waste as fuel to grow vegetables (Chiara, 2012). Someone unskilled in construction can build one with simple instructions.

Figure 1: Keyhole Garden
Source: Chiara, 2012.

Each keyhole garden unit should be constructed with Interlocking Stabilized Soil Blocks (ISSBs) produced by new business owners from the ISSB block compressing machine buy-out program specified later in this section.

Sack Gardens

Alternatively, if there is not ample space for construction, sack gardens **(Figure 2)** may be employed. Sack gardens offer many of the same advantages that keyhole gardens do. Sack gardens require only a small area, but yield a relatively large amount of garden growth. A one cubic meter sack may provide as much as five cubic meters of potential growing area, and can grow vegetables with mostly reused materials, so the cost is generally limited to the seeds and seedlings. (Appropedia, 2012)

Figure 2: Sack Garden
Source: Cheffy, 2013.

Toilet Block

Health is a major issue in slums with people living in very close proximity to one another without toilet facilities or waste removal resulting in water contamination leading to possible epidemics. Thus, the need for basic toilet facilities is apparent. In conjunction with the water and sanitation team, the installation of self-sustaining toilet blocks throughout 19 of Mysore's 69 acknowledged slums is proposed (Administrative Staff College of India, 2011). Each toilet block has the capacity to serve over 1000 people per day and reclaim the waste to produce biogas for heating and cooking, potable water and fertilizer.

The construction of these facilities is also coupled with the above mentioned business initiative for the inhabitants of the slums. Each toilet block will be constructed with ISSBs, made with the manually operated ISSB compression machine. It is proposed that after the completion of a toilet block, the workers are offered a buy-out program for these machines to begin their own business. More detailed information can be found about a proposed toilet block in the water and sanitation section of this paper.

Gender-based Hiring or Gender-based Training Programs

It is recommended that incentives be created for the employment of women and single mothers from Scheduled Castes or Tribes. The

recommendation is initially to charge a tax by industrial sector for not hiring a predetermined quota from such a population to be replaced over a period by incentives for hiring and training. The proceeds from such tax would go to the development of vocational and technical education centers for these women. To this end, a sum of US$ 250,000, equally spread out over 5 years, is suggested for awareness campaigns and the partial funding of education centers.

2. Industry

Background: Indian Industrial Development

The second largest city in Karnataka state, Mysore is unequivocally its cultural center. The *Dasara* is a ten day celebration with a 400 plus year history, and includes parades, performances, and other cultural and religious events. The festivities attract tourists from the state, country, and even international guests. Between 2006 and 2010, the number of tourists who visited the city increased from 1.4 million annually to over 3 million (Kumar, 2011). Other historically important industries are sandalwood and silks (Mysore City Corporation, 2013). Recently, the city has expanded its economic base to include technological services, engineering and heavy industry.

Mysore Industrial Areas

Following the direction of the State's Fiscal Reforms Facility, the state government in Karnataka set aside more than 5280 acres of land to establish 45 Special Economic Zones (SEZs). Of these approved zones, 33 were committed to Information Technology (IT), generating an investment in the state of over US$3.9 billion, which will provide direct employment to 615,500 people (Mudde, 2008). Mysore will have SEZs committed to food processing, IT, and readymade garments.

The Karnataka Industrial Areas Development Board (KIADB) acquires land to form industrial areas in the state, provides basic infrastructure in those industrial areas, and then attracts global investors. To date, the KIADB has formed 141 industrial areas in the state, covering over 40,000 acres. The largest of these industrial areas is Hebbal, which includes Electronic City, home to campuses for both Infosys and Wipro. It consists of 1387 acres of land, which is primarily dedicated to fostering growth in Information Technology (IT). In 2007 - 2008, the Mysore-based IT sector contributed US$ 220 million to the Indian IT export economy (The Hindu, 2008).

Problem Statement

While revenue generated from tourism is likely to grow, the city cannot afford to maintain a singular focus on tourism alone. Mysore needs to diversify to include a broader base of sectors by adopting policies to attract investment from domestic and international interests. Bangalore, the economic heart of Karnataka State and an international source of expertise in IT services, sits 143 km to the northeast. However, due to poor roads, the trip takes more than three hours, twice as long in a developed country. Mysore's primary developmental gap is not one of designation, but rather system integration. To accomplish this, improved infrastructure and diversified investment are necessary.

Selected Options

In order to address this challenge, the city of Mysore should adopt three options. The first is the construction of an international airport,

which will require nearly 343 acres of land to be acquired around the existing Mysore airport and consist of 3 stages of construction. The second is the privatization of electricity distribution in the city of Mysore to allow energy companies, rather than the government, to control the transmission and distribution of electricity. The third option is higher investment in Mysore's growing manufacturing and retail sectors and a change in policy. This will involve increasing the funds allocated for the improvement of infrastructure conducive to reliable logistics, including expansion and repairs of existing highways, land acquisition for distribution centers, and technological advances in the freight industry. The growing retail industry will require a change in policy which requires single-brand retailers to have no less than 30% of their products originate from India lowered to 15% to respond to consumer demand and stimulate sales.

3. Sewage and Solid Waste

Problem Statement - Sewage and Solid Waste Management in Mysore

The management of sewage, including collection, transportation and reuse, is a challenge, compounded by problems of overflow. Presently, the existing sewage treatment plants in the city are below required capacity. There is inadequate sanitation in schools, commercial blocks and households and inadequate public facility, leaving people to resort to open defecation (Mysore City Corporation, 2011).

The population of Mysore generates about 385 tons of solid waste a day, excluding waste generated from industries, restaurants, hospitals, construction activity and bio-medical waste (Harish, 2012). It is estimated that by the end of 2020, the waste generated could reach 583 thousand tons per year (Mysore City Corporation, 2011), which requires improved solid waste management systems to control the generation, collection, transportation, processing, treatment and disposal of waste.

Efficiency rate of collection and transportation rate of solid waste in Mysore is 61.5% (Mysore City Corporation, 2011). According to the Draft City Plan of Mysore, owing to low capacity of the composting plant (200 TPD capacity), excess waste is dumped on adjacent vacant land. When waste is processed, organic waste is composted, dried, packaged and stored to sell, whereas non-compostable waste is tossed onto the adjacent land. To accommodate the increasing generation of solid waste in Mysore, a more efficient process is needed, including a landfill (Mysore Urban Development Authority, 2012).

Selected Options - The Sewage Sector

The following projects **(Table 2)** were selected for implementation to improve Mysore's sewage situation:

Rank	Projects
1.	Construct ventilated improved latrines at discounted, subsidized prices for households.
2.	Extend the de-silting of manholes and the repair of Underground Drainage Systems (UDGS)
3.	Re-construct nallahs with concrete and de-silt open drains.
4.	Construct toilet facilities for all public schools in Mysore.

Table 2: Selected Sewage Options for Implementation
Source: Edelman, 2014.

The Solid Waste Sector

Based on their political and economic feasibility, as well as the prospective impact of all possible technical alternatives, the following solid waste options **(Table 3)** were selected for implementation:

Rank	Projects
1.	Develop, adopt, and implement new responsibility acts and government policies.
2.	Reform the hazardous waste sector.
3.	Decentralize recycling centers.
4.	Establish and develop a landfill with a gas collection system.
5.	Enlist all health facilities of the existing treatment system available in the city.
6.	Purchase biomedical waste bins to facilitate waste segregation at health facilities.
7.	Implement a study of decentralized biogas centers to evaluate expansion possibilities.

***Table 3: Selected Solid Waste Options for Implementation**. Source: Edelman, 2014.*

4. Transportation

Problem Statement

Mysore's transportation network faces significant pressure. First, the city's population is growing at a rapid pace, as is the number of registered vehicles (Mysore Urban Development Authority, n.d.). Second, the numerous transportation modes (motorized and non-motorized bikes, four-wheeled vehicles, buses, auto rickshaw, etc.) are not separated from each other, causing sometimes chaotic and dangerous situations, as well as traffic jams in many areas. Third, Industrial operations in Bangalore are likely to expand closer to Mysore due to severe congestion in Bangalore. If Mysore does indeed absorb economic activity from Bangalore, the city must steer this growth into areas that will cause the least congestion and pollution. Fourth, the commuter rail line between Bangalore and Mysore has yet to be fully doubled and electrified, which may contribute to an influx of vehicular traffic between the two cities. (Aravind, 2013). Fifth, Mysore is a major tourist destination.

Priorities

The following goals **(Table 4)** were deemed priorities for improving the transportation network and accessibility in Mysore:

Rank	Priorites
1.	Connect existing transportation options into an integrated system.
2.	Improve public transportation, specifically the crowded bus system.
3.	Discourage vehicles from entering Mysore through park-and-ride facilities and tolling of major roads entering the city.
4.	Boost pedestrian safety through investment.
5.	Reduce tourist traffic through a year-round shuttle system.
6.	Improve the commuter rail system by completing the doubling and electrification of the line between Bangalore and Mysore.
7.	Improve existing roads, especially major roads entering the city.
8.	Implement public policies that ban certain vehicles on major roads to improve traffic flow and increase safety.

***Table 4: Priorities for Future Transportation Projects**. Source: Edelman, 2014.*

5. Energy

Mysore's energy demands are geometrically increasing. By 2020, the population is expected to increase to 1,412,800 (Mysore Urban Development Authority, 2012), and an increase in industrial and consumer activities is expected. The city's electricity production is directly tied to that of the state, and production has been steadily increasing, much of it derived from hydro, thermal, and, happily, cogeneration, while electricity sales in Karnataka are primarily to agriculture, high voltage industry and for domestic needs.

Problem Statement

With a growing population and a desire for electricity intensive IT industrial development, Mysore's energy demands are surging. The main goal of this section's proposals is to increase electric generation, while both avoiding excessive capital outlays for additional large-scale generation plants and minimizing the environmental impact of capacity enhancement.

Priorities

The following **(Table 5)** are considered priorities for improving energy efficiency and long-term sustainability in Mysore:

Rank	Priorities
1.	Conserve energy through end user efficiency enhancement.
2.	Maximize energy potential and reduce waste quantity by returning waste items to the stream of energy production through benign electric generation enhancement.
3.	Reduce diversion of natural gas to fertilizer production with national agricultural reform.

***Table 5: Priorities for Future Energy Projects**. Source: Edelman, 2014.*

Selected Technical Options

Project 1: Light Bulb Replacement in Amba Vilas Palace

The Amba Vilas Palace is the official seat of the Wodeyars - the Maharajas of Mysore - the former royal family, which ruled the princely state before Indian Independence. According to Greenpeace (Greenpeace India, 2007), if the Amba Vilas Palace were to switch all of its 96,000 bulbs from incandescent to compact fluorescent (CFL), it could reduce its annual electricity usage from 120,000 KWh to 40,000 KWh, lower its carbon footprint by 46,632 kg. (102,590 lbs.), and save nearly US$ 66,764 from its annual electricity expenditure. Switching to LED bulb though costlier would yield greater benefits over a longer period.

Project 2: Community Wide Energy Efficiency Rebate Program

Structural retrofits that improve energy efficiency not only reduce end use expenditures, but also stimulate the local economy through workforce capacity building and material stream provision and recycling. This suggested program, which would be heavily advertised (US$50,000), would provide up to US$10,000 in rebates to a building owner for the appropriate technology changes and tightening of the cooling envelope. Over a 20 year period, this program would train certified energy auditors (US$132,000), incentivize product manufacturers and waste recovery (US$200,000,000), and offset the cost of building additional electric generation stations through energy savings.

Project 3: Waste Heat Recovery

Given that 27% of the electricity in Karnataka is generated thermally, primarily through the

combustion of coal, a waste heat recovery system is a strategic manner in which to increase production without increasing the quantity of fuels burned. Dürr Engineering (Dürr AG, 2013) produces variable Organic Rankin Cycle (ORC) models to fit specific heat availabilities and generation requirements, adding an additional 11% or 22% gain in the conversion of heat to electricity in the original thermal system. A feasibility study should be conducted to determine the specifications of the units required for such a project, as well as the technical, logistical, and financial need.

6. Water

Background - Flooding

Flooding is a significant problem within Mysore, particularly during the May to November monsoon season. The practice of open defecation in the city, as well as a waste treatment plant being located in the flood zone, leads to human waste being picked up by the flood waters and sitting as a breeding ground for illness. As the water dissipates, it carries these pollutants to the water sources thereby resulting in unsanitary drinking water, especially for the impoverished slum dwellers.

Sanitation - Toilet Complexes

Mysore's slums do not have consistent access to sanitary sewage removal. Furthermore, methods of waste disposal may vary by household. The methods range from internal septic tanks to open drainage channel to underground drainage system. Moreover, individuals may practice open defecation. This presents a lack of uniformity in waste sanitation. Given the incidence of poorly regulated human waste disposal, the risk of drinking water contamination resulting in subsequent outbreaks of fecal-oral transmitted disease remains high without a targeted slum intervention. A centralized toilet complex in portions of the slums can aid in combating this threat to public health as it can be standardized and regulated.

Water Supply

Today, 85% of Mysore's residents receive drinking water from a piped supply system sourced from the Kaveri and Kabini Rivers (Scheme, 2006). There are also numerous private companies selling bottled water in Mysore. These companies provide water that is not always hygienic, and can be more expensive (Raju et al., 2010). Moreover, there are many limitations to the availability and uses of this supply: piped water is available for approximately 3 hours/day for household use, as water for agricultural purposes limits usage in the city (Maramkkal, 2012). In addition, Unaccounted for Water (UFW) due to theft, lack of operation and maintenance, and inadequate storage accounts for up to 50% of water usage (Scheme, 2006). Mysore has adopted a plan addressing many of its water supply problems, and steps to rehabilitate water facilities, impose strict metering and efficiently retain water are being considered (Ibid.).

Selected Options

Urban Tree Pits and Constructed Wetlands

To address the issue of flooding within the city of Mysore, two projects to be implemented consecutively are recommended: a series of 378 urban tree pits and the installation of two wetlands of 1 to 4 acre. Urban tree pits for this project are a structured planting of trees for the specific purpose of absorbing rainwater runoff while filtering toxins and pollutants from the water (Charles River Watershed Association, 2008). The two wetlands should be located at the base of decline of highlands in order to retain storm water runoff from higher elevations.

The Adarsh College Model

The Adarsh College Model **(Figure 3)** is the recommended option for sanitation. The system consists of a toilet house with passive (gravity fed) urinals with 4 pour flush toilets and 1 western style toilet per gender. Additionally, 5 urinals are built in for a total of 15 waste collection units. The collection units drain into a passive treatment complex that consists of a biogas settler, an anaerobic baffle reactor and up flow filters. The biogas settler produces 6.8 cubic meters of gas for cooking or lighting purposes (Zimmermann, Wafler and Thakur, 2010).

The anaerobic baffle reactor/upflow complex

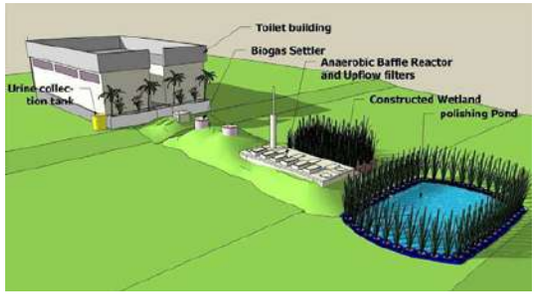

Fig 3: Adarsh College Model
Source: Zimmerman, Wafler and Thakur, 2010.

holds 1.5 days of wastewater and produces 9.75 cubic mt. per year of agriculture grade compost. The toilet complex produces 8 cubic mt. of wastewater per day that flows through a wetland with a commensurate capacity to a collection pond. The entire complex occupies approximately 93 sq mt. Given that the toilet blocks require a slight gradient for passive drainage, excavation of the intended areas for the treatment system will provide soil that can be utilized for the creation of Interlocking Stabilized Soil Blocks or ISSBs (Ibid.).

Rainwater Harvesting

Rainwater harvesting (RWH) is proposed here as the most efficient and easily implemented option to supplement Mysore's water supply. Karnataka has already heavily invested in RWH (Scheme, 2006), and the National Institute of Engineering – Center for Renewable Energies and Sustainable Technologies (NIE – CREST) has started urban programs and training on RWH within Mysore. Their projects include a RWH system at Mysore Palace using rainwater for gardening. Because of Mysore's urban environment and high density of housing in slum areas, using rooftop RWH systems is suggested (Lakshmi, 2009).

7. Finance

Objective

The objective here is to identify funding sources, both foreign and domestic, for the various projects suggested by each sectoral group. The financial team reviewed all requests for funds and created a database that would determine the financing ability of each project based on projections of foreign direct investment, foreign aid and Mysore's capacity for municipal debt. The process of financing each sector's projects is outlined below.

The Process

Research Process for Foreign Direct Investment

In this paper, Foreign Direct Investment (FDI) is defined as a direct investment of one country in another. This is done either by investing in a previously existing business, or by financing a

new one. The countries that have invested the most in India are detailed later in this section.

Research Process for Foreign Aid

Foreign aid is defined here as Official Development Assistance (ODA) in areas of need such as food aid, emergency relief, peacekeeping, infrastructure, poverty alleviation, etc. The most significant foreign aid agencies in India are: JICA (Japan), DFID (UK), AFD (France), SIDA (Sweden) and USAID (United States). After calculating the total amounts given, the sectors each aid agency contributed to were identified. Certain countries had the propensity to focus on one sector more than another. For example, most of Japan's aid was tied up in transportation (jica.co, 2013), whereas France focused on renewable energies (afd.fr, 2013). In determining the amounts given to specified sectors, the team needed to make certain assumptions. For instance, if it found a project SIDA was involved in was with a city similar in size to Mysore, it assumed that SIDA would be willing to give the same amount to a similar project located in Mysore. Another aspect necessary to consider was the fact that Britain's foreign aid agency (DFID) is ceasing all aid to India as of 2015. It is, however, fulfilling all commitments made before then (gov.uk, 2013; gov.uk, 2011.).

Determining Mysore's Maximum Debt Capacity

Mysore does not publish its budget on an online database. As a result, an assumption was made that the debt capacity for the cities of Mysore and Cincinnati, USA, cities of relatively equal size, were similar. The financial team determined Cincinnati's debt capacity, based on the 2014-2015 proposed budget specified on Cincinnati's website (Cincinnati-oh.gov, 2013), to be US$520,400,000 of post- sale general obligation unlimited tax and debt. As of December 4, 2013, the 30-year US Treasury bond rate was valued at 4%. Therefore, the financial team assumed that Mysore could assume a maximum debt of US$30,094,783 per year based on the 30-year US Treasury rate of 4% and a maximum debt allowance of US$520,400,000. It was also assumed that Mysore would account for 20% of each year's total cost. If the 20% portion of Mysore's financing exceeded US$30,094,783 in any given year, then additional financing would need to be sought for the remainder of Mysore's 20%.

The Grant Application

While the need for funding to improve the environment in Mysore is significant, there is a limited supply of resources. Consequently, the financial team created a grant application for each sectoral team to complete. The grant application created the opportunity for each group to request funding in a structured manner. The financial team focused on the prioritization of projects, project cost per year, and percentage of project completed at the end of 5 years.

Database

The finance team compiled a series of Excel spreadsheets to document the detailed funding requests and identify foreign aid, foreign direct investment and debt capacity for Mysore. A brief description follows.

Request for Funds

The first spreadsheet was the Request for Funds, which summarizes each team's funding requests from the grant application. As noted above, the assumption was made that Mysore would finance 20% of each project's total cost. The total amount that Mysore would need to finance over the 5-year period of funding is US$84,939,643.

Estimated Project Cost by Year

The second spreadsheet was the Estimated Project Cost by Year worksheet, which is also a result of the grant application. Teams were asked to provide their request per year to ensure a steady level of financing over the 5-year period. This worksheet is also important because it was used to evaluate the level of Mysore's 20% debt each year and because it shows how much money needs to be financed each year after the local currency costs are calculated.

Proposed Aid by Country

Once the amount each foreign aid agency gave to India by sector was determined, it was necessary to make assumptions to determine a realistic amount that would be given to Mysore. This was done in a third spreadsheet by first calculating the percentage of India's population living in the state of Karnataka to be 5.3%, and allocating total aid accordingly. After the 5.3% of aid was given to Karnataka, the assumption was made that Bangalore would receive 25% of this total, and Mysore 20% (the same percentages used to calculate the FDI figures) given their relative size and importance in the state. This process was used for each sector that received funds from that particular aid agency. With this information, the financial team was then able to address a sectoral team's preliminary questions regarding how much money it could expect from each country.

Proposed Aid by Project

After total amounts of aid given by each country by sector were ascertained, a fourth spreadsheet was prepared to show the respective funding found for each sector, in order for teams to see how much they could expect for their own projects. It was again assumed that Karnataka represented 5.3% of India's population, and that 20% of this total would be allocated to projects located in Mysore.

Amount Needed for Financing of Selected Options

Fifth, the total amount that must be financed through loans or other funding sources is listed on the Amount Needed for Financing of Selected Options spreadsheet. This displayed projects of each sector with their total cost (grant requested for 5-year period), amount of aid identified, local financing component and deficit if any. The sectors that do not need additional financing are water, transportation, and industry. The team requiring the largest amount of additional financing is energy. However, more aid was found for transportation related projects than for energy. Nevertheless, substantial foreign aid was found for most sectors.

Foreign Direct Investment Estimates

The process of financing each sector's projects began with an examination of what countries played the largest role in terms of Foreign Direct Investment (FDI) in India, and the finance team compiled a list of the top contributors. It then focused on the top 7 countries that invested in India (i.e., Singapore, USA, UK, Netherlands, Japan, Germany and France), and calculated the amount they gave

each year assuming that Mysore would be able to utilize 10% of those funds, given its relative importance. For example, Singapore invested a total of US$21,600,000, which, over a 13 year period, came out to be US$1,661,538 annually. Once the 10% assumption is factored in, Mysore would have US$166,154 with which to work. The finance team found the vast majority of FDI funding is to come from the US, which for Mysore is US$14,474,286. These countries taken together are able to contribute a total of US$21,206,643 to Mysore. Another factor here is the propensity of a country to invest in a particular sector. These countries are most likely to invest in: services, construction, telecommunications, computer software and hardware, drugs and pharmaceuticals, chemicals, autos, power, metallurgical industries and hotel / tourism. It is, then, the responsibility of the sectoral teams to conclude whether or not their projects can elicit funds from FDI, and, if so, to estimate how much they could obtain.

Loan Availability

The finance team searched for the loan rates and terms of payment of various banks (deccanherald.com, 2013), and found that the World Bank provides an IBRD (International Bank for Reconstruction and Development) loan of various lengths and interest rates. Loans to be repaid in 12 years or less are offered at 0.28%; those to be repaid in 12 to 15 years are available at 0.38%; and loans to be paid over 15 to 18 years are offered at 0.48%. Each loan required a 0.25% front-end fee as soon as the project goes online in order to obtain the IBRD loan (treasury.worldbank.org, 2013). The Asian Development Bank offers a LIBOR (London Interbank Offered Rate), which is a loan that utilizes average interest rates as determined by leading banks in London. This loan is offered at 0.35% over a span of 19 years. There is no front-end fee required in order to obtain the loan. The finance team made the assumption that the interest rate is 0.35% given that this was the rate offered in the past 6 months (adb.org, 2013). The last loan found is a direct loan offered by the US Export-Import Bank, which is offered at 2.99% and could exceed a loan term of 11 years, but not 12. The exception would be a loan used to develop a renewable energy project, which could be obtained at 3.82% over a span of 18 years (treasury.gov, 2013).

Financing Development

Financing foreign development has been made easier since the onset of globalization. However, the ability to attract a level of financing that will mitigate all of Mysore's inadequacies in industry, energy, poverty, sewage and solid waste, transportation and water is minimal. Mysore has a strategic location 3 hours from Bangalore, which makes it an ideal location for foreign investment. The city, like the rest of India, is growing at an astonishing rate, shifting more people into the middle-class than ever before. Financing development in Mysore is required for it to participate in the continued success of India's economy, and the problems in Mysore will prove to be severe if the city cannot continue to attract a certain level of aid and foreign investment.

Final Comments

The intent of the project this paper summarizes was to bring the contemporary thinking and practice of Urban Environmental Management to the solution of real problems in a major city in a developing country. The exercise, then, was to replicate as much as possible the conditions under which a team of expatriate consultants would operate in this context so that they could develop solutions that fit the circumstances they would likely find as professional planners. In this working environment, it was instructive for the students to formulate a 5-year plan of solutions to the environmental problems and issues they faced rather than to be told how to solve them. ■

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