Précis

WORLD BANK OPERATIONS EVALUATION DEPARTMENT SUMMER 1998 NUMBER 157

Reducing Flood Hazards and Traffic Congestion in Tunisia

THE FIRST FREE-STANDING FLOOD PROTECTION project funded by the World Bank in Tunisia successfully reduced the flow of uncontrolled water and damage to urban areas, according to a study by OED.* The Sfax Flood Protection Project also built a bypass road on both banks of a new drainage canal, improving access to peripheral areas of the city, creating new commercial and real estate investment opportunities, and values. The canal (also funded by the project) reduced flood-related health hazards by preventing contamination and helping to drain stagnant water.

An OED survey of local residents and businesses found that most respondents believe the project had a positive impact, but that benefits could have been greater had the policy framework for infrastructure been more supportive of the project's objectives. The study concludes that it is very difficult to solve flood and traffic problems with infrastructure alone, and recommends that similar operations in the future address policy improvements that can enhance project benefits.

Background

In 1982 severe floods struck Sfax, a major Tunisian city, and its suburbs, killing more than 70 people. Economic losses were estimated at about $80 million. More than 700 houses were destroyed and 8,000 others damaged, along with streets, roads, bridges, railways, power supply lines, and telecommunication equipment.

The following year, the World Bank approved a $22.3 million loan for the Sfax Flood Protection Project, with the goal of minimizing the damage potential of future flooding in the city. The project aimed to reduce loss of life; provide a

greater sense of security; curtail economic losses; and ensure permanent and efficient maintenance of flood protection infrastructure. The flood $40 million protection project was designed to:

- realign 9 kilometers (km) of a dry watercourse to channel flood waters;
- create a protective embankment;
- build a dike 10 km north of Sfax; and
- construct a 13-km long canal and bypass.

Study methodology

The study team conducted research and on-site inspections. A separate field survey team evaluated the project's impact on beneficiaries and stakeholders. The study included interviews, a building census of about 500 commercial buildings, document reviews, focus groups, and a detailed questionnaire of 120 households, traffic accident reports and building permit applications. Survey results were supplemented by data provided by the city and central government agencies. A participatory evaluation workshop (see box) was also conducted for local stakeholders.

Performance

Objectives set for the canal and highway were mostly met, within time and budget constraints. Three factors contributed to successful implementation: high local capacity to plan and supervise works; timely disaster mitigation planning (a flood damage reduction master plan had been prepared before the 1982 disaster); and earlier Bank work in storm water drainage. The project's economic rate of return was 23 percent at project completion.

Yet the study found that effects were below potential levels: the study cited the inadequacy of the supporting infrastructure and shortcomings in urban policies as possible causes.

Inadequacy of the supporting infrastructure. The project did not fully solve the problems posed by torrential rains because there are insufficient roadside drains and storm sewers in the city. Project design focused on diverting floodwaters moving toward the city from inland areas, but paid little or no attention to the disposal of storm water falling on the city itself. Roadside drains and storm sewers constructed under a follow-up urban project have helped, but even these are not sufficient to handle the water flowing in the streets at peak periods. As a result, heavy rainfalls are not being fully channeled into the canal and standing water remains on the roads and in residential areas, causing health and pest hazards.

Shortcomings in urban policy. The policy framework in which the project operated did not fully support project objectives. For example, transport policy favored the development of private over public transport, with the almost inevitable result that improvements in traffic congestion and travel times--thanks to the bypass road--gradually diminished as the number of vehicles grew.

Similarly, urban policy permitted only sparse settlement in areas that were expensive to protect and allowed vast tracts of urban land to be kept off the market for speculative purposes. Although the city is expanding beyond the existing flood protection canal in accordance with approved development plans, Sfax's urban sprawl has covered a far larger area than necessary and has probably created the need for a second, longer, and more expensive flood protection canal.

The presence of pollutants in the canal is the result of inadequate urban policies. About 60 percent of houses in the city are not connected to the sanitation network, and less than one third of the houses within a 70-meter-wide area on both sides of the beltway are connected to the sewer network. However, network connections in areas adjacent to the project are expected to increase significantly as a result of the Bank-funded Fourth Urban Project, which will lay about 200 km of sewer pipes.

Flood Control Impacts

The project brought significant flood control benefits. Water from heavy rainfalls, athough not of catastrophic

Workshop for Implementation Staff

OED ORGANIZED A WORKSHOP FOR THOSE who participated in the implementation of the project. Many of those attending (officials from ministries and government agencies) completed a questionnaire which identified the lessons learned by the government through its participation.

Participants suggested that the government needs to address the costs associated with holding vacant or under-utilized urban land and the lack of incentives for maximizing public investment. Other measures proposed by the workshop included urgent measures to overcome project deficiencies through the following additional investments:

- lighting for walkways and streets along the bypass;
- improving drainage from roadside to canal and from canal to sea;
- increasing the number and quality of pedestrian facilities;
- improving the functioning (timing, repair) of traffic lights;
- providing more frequent canal maintenance; and
- widening bridges to reduce accident risks.

flood volumes, is handled by the flood control system with greater ease than in the past, and no flooding has occurred since 1982 (1990 and 1995 had the highest total rainfall and the highest instances of torrential rains since project completion). Municipal sources estimated the savings in averted damage at $2.5 million a year. This figure does not include the considerable economic losses averted in property, personal belongings, and foregone production.

In its survey and interviews, OED found that residents living near the canal appreciated the flood protection works. The survey quoted the canal's contribution to people's safety as the most frequently cited benefit. This aspect was cited more by lower-income households (81 percent) than by middle class ones (73 percent) because the former had been hit harder by the floods.

Urban Development Impacts

New construction. The substantial amount of new construction in previously damaged areas attests to the increased confidence of public and private developers. Between 1988-94 the number of houses located near the canal increased 56 percent and the number of occupants more than doubled, reaching about 12,000.

Easier access. The canal and especially the bypass road were important catalysts of urban development because they greatly improved access to and from agricultural areas that were being rapidly urbanized, and that previously had poor or no access for vehicles. Ease of access made these areas more desirable to live in and created new commercial and real estate investment opportunities. Between 82 and 90 percent of respondents surveyed stated that the canal and road had had a positive effect.

Land prices. Inside the canal's protective barrier were expected to increase at a higher rate than those outside, but this has not been the case; both have risen considerably since project completion. Land prices inside the canal area rose largely because the project—athough it disrupted neighborhood social interaction patterns and changed land boundaries—boosted demand for middle-income housing lots. However, the dike built outside the city allowed some agricultural land to be rezoned for urban development, increasing the land's value by as much as 400 percent.

The study gives several explanations for the failure of the expected land price increase within the protective barrier: (i) vast tracts of land outside the area protected by the canal were also protected by dikes, storm sewers and other drainage infrastructure; (ii) the danger of high water levels was reduced, both inside and outside the canal zone, by the new channel to the sea; (iii) the land inside the canal was less adequately served with storm drains; (iv) land prices reflect travel times, and demand has gradually shifted to high-status neighborhoods—outside the protected areas—previously considered far in travel time to the city center; and (v) residents discount the value of protection because they do not expect to see another major flood in their or their children's lifetimes (experts estimated the chances of the 1982 flood recurring at 0.66 percent—once every 130 years).

Effects on Traffic

Measuring project impact on traffic reduction in Sfax was made more difficult by the growth in the total number of vehicles in circulation. The number of cars has increased five-fold since 1971, reaching 36,000 in 1996.

Reduced downtown congestion. Today, it takes 10 fewer minutes to go through the city via the bypass than it does through downtown. Before the project was implemented, traffic at the entrances to downtown Sfax increased at an average annual rate of 5.6 percent. Since 1990, when the bypass was built, the traffic growth rate has slowed to 3.8 percent a year. If not an outright reduction, this drop in the growth rate suggests that part of the increase in traffic has been absorbed by the bypass. Three main downtown streets have registered an absolute drop in traffic volume (one with a 60 percent reduction during peak hours).

The annual traffic increase on the bypass (16 percent) is considerably higher than those of other major routes. This increase shows the extent to which traffic is being diverted from other major routes and is among the most important indicators of project impact.

Accidents. Urban growth and commercial development account for the heavy traffic on the bypass road and partly explain the steady rise in the accident rate, despite traffic lights and speed limits. The number of accidents on the bypass increased at an average yearly rate of 28 percent between 1991-95. The accident rate was classified as excessive by the engineers who conducted the traffic study. Engineers attributed the current dangers to technical weaknesses in the bypass design, most notably to narrow lanes and bridges, difficult crossroads, insufficient signals, and lack of street lights (street lights are scheduled to be introduced under the government's Ninth Development Plan).

Secondary effects. A secondary benefit of the project has been that vehicles carrying flammable and other hazardous materials now take the bypass, reducing pedestrian exposure to chemical vapors in the most densely populated areas. The flood protection works provided residents, especially the poor, with a greater sense of securit—a psychological benefit. The bypass also spurred the creation of new businesses: the area along the route now bustles with the activity of about 400 new

business establishments. But it was not the project's intent to attract commercial development to the area. To enhance further economic development and curtail congestion, more service lanes, parking lots, and ramps need to be built.

Environmental Benefits

Positive effects. The project channels flood waters into a drainage system, reducing damage to urban infrastructure, protecting private and commercial dwellings, and reducing erosion in the project area. The canal has also improved environmental sanitation by preventing flood-related contamination (sewage overflows and waterborne garbage) and by helping to drain stagnant water, thus reducing health hazards. This was achieved in many neighborhoods.

Negative effects. The project did have some negative environmental impact: the accumulation of contaminated groundwater and polluted water in the canal. Pollutants in the canal are the result of urban policies in general. As more residential plots are connected to the sanitary network, the level of pollution may be expected to abate.

Institutional Development

The institutional development resulting from government participation in the project was modest. The most noteworthy institutional achievement was the creation of a maintenance unit for flood protection works, a first in the Ministry of Equipment. Three similar units have been established in other parts of the country, all modeled after the Sfax maintenance unit.

Conclusions

Overcoming traffic congestion is a long-term process, which requires a supportive legal framework. The process also requires institutional development components, which must be in place and functioning before projects begin.

The study concludes that it is extremely difficult to solve flood and traffic problems solely with physical infrastructure, and that similar projects should also address policy improvements that can enhance flood protection and traffic benefits.

Précis

*Impact evaluation report: "Tunisia: Reducing Flood Hazards and Traffic Congestion," by Ronald Parker, Report No. 16777, June 1997. Available to Bank Executive Directors and staff from the Internal Documents Unit and from regional information service centers, and to the public from the World Bank InfoShop:
1-202/458-5454
fax 1-202/522-1500
e-mail pic@worldbank.org.

Please address comments and inquiries to the Editor-in-Chief, Elizabeth Campbell-Pagé, tel: 1-202/473-5365, fax: 1-202/522-3125, e-mail: ecampbellpage@worldbank.org

Please address publication requests and inquiries to OED, tel: 1-202/458-4497, fax: 1-202/522-3200, e-mail: eline@worldbank.org

This and other OED publications can be found on the Internet, at http://www.worldbank.org/html/oed