

CASE STUDY

Bekasi, Indonesia

Gresham, Oregon

Eliminating Vehicle Pollution and Increasing Economic Productivity

CityLinks Partnership between
Bekasi, Indonesia, and Gresham, Oregon





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As in many cities around the world, traffic was perhaps the most obvious and pressing problem in Bekasi, Indonesia. Day and night, traffic clogged city streets and major arteries into and out of the city. Residents spent as much as six hours each day commuting to and from their jobs in downtown Jakarta, just 12 miles away. Some risked their lives trying to cross busy streets and blind intersections. Pollution fouled the air. With the support of *CityLinks* partner Gresham, Oregon, Bekasi's residents and commuters today can travel to and from their destinations faster and more safely, while pedestrians and street vendors can breathe more easily. City staff and transportation officials have adapted Gresham's computerized traffic modeling systems to analyze Bekasi's major transportation problems and assess viable alternatives. Bekasi has relocated street vendors, improved the timing of traffic signals, and made geometric alterations to streets and sidewalks. These changes have eliminated gridlock on most of Bekasi's streets and are saving an estimated 400,000 commuters at least an hour of commuting time each day.



Introduction

As part of Indonesia's decentralization, Bekasi—a large and growing suburb of Jakarta—suddenly found itself responsible for duties previously performed by the provincial and central governments. City officials struggled to find solutions to a multitude of problems, and to provide citizens with the services they expected.

Traffic congestion was perhaps the most visible problem in Bekasi. Day and night, traffic clogged city streets and major arteries into and out of the city. Residents spent as much as six hours each day commuting to and from their jobs in downtown Jakarta, just 12 miles away. Gridlock backed up from Bekasi's congested streets onto the eight-lane toll road to the east of the city, causing delays of three to four hours and impeding the movement of goods and services as well as of commuters.

In addition to such delays, the traffic had created a public health concern by contributing to heavy air pollution in greater Bekasi. And drivers and pedestrians alike risked their lives trying to cross busy roads. Street vendors lined Bekasi's sidewalks and roadsides, forcing pedestrians into the roadways, where they risked being struck by passing vehicles and exacerbated the gridlock. Pushcarts and bicycles shared the crowded roadways with cars and buses, creating still further chaos.

In addition to the sheer number of people living in and near Bekasi, several other factors were contributing to the gridlock. Only eight traffic signals were in place to manage the flow of traffic. The downtown loca-

Bekasi Facts

Location: Java, Indonesia; adjacent to Jakarta

Population: 1.6 million

CityLinks Partner: Gresham, Oregon

Partnership Dates: 2001-2003



The CityLinks Model

The *CityLinks* methodology is flexible, and is tailored to meet the needs of each participant. In the Bekasi-Gresham partnership, meetings were held between practitioners of both cities, alternating the meeting place between each city. Meeting first in Bekasi exposed Gresham practitioners to the transportation and cultural issues in Bekasi so that Gresham could begin to prepare an initial response to the challenges. Meetings in Gresham allowed Bekasi practitioners to begin to understand what was possible, see firsthand Gresham's transportation management system, and work side-by-side with their Gresham partners to adapt the modeling packages Gresham uses to analyze and maintain its transportation system to accommodate Bekasi's situation.

tion of Bekasi's main intercity bus terminal, which handled 6,000 buses a day, was also problematic. The bus traffic added to the congestion of downtown streets and contributed to the city's noise and air pollution. Moreover, as the population of Bekasi grew, the bus station—like other transportation infrastructure—was inadequate to meet the growing demand, resulting in crowding within and without the terminal itself. With insufficient parking spaces, cars and taxicabs stopped in the middle the street to drop off or pick up passengers. Buses, too, often stopped in the middle of nearby streets, because there wasn't enough room at the terminal.

Bekasi had tried to address its transportation problems. The city had undertaken two transportation analyses: one by an Australian firm, and another by a Japanese firm. The resulting reports contained reams of data but sat unread and unused on a shelf. With no transportation modeling software and no hands-on assistance to guide them, city officials were unable to utilize the information in the studies or to model traffic patterns. The city also was hampered by a lack of interagency planning for metro area transportation networks.

ICMA chose the U.S. city of Gresham, a suburb of Portland, Oregon, to partner with Bekasi. Although Gresham is much smaller than Bekasi, it, too, had struggled to provide commuters with the infrastructure they needed to get to and from a neighboring city. Due in part to urban growth boundaries that protect much of the nearby rural land from development, Gresham also struggled with increasing population density and resulting demands on its budget. But Gresham had risen to the challenge, creating a comprehensive transportation network that served its residents, and implementing a range of innovative practices to overcome the gridlock that naturally occurs when commuters all travel on the same roads simultaneously. Gresham had involved its citizens in crafting solutions to its traffic problems and ranked twentieth in the United States in number of people using public transit or ride-share to get to work. ICMA believed Bekasi could benefit from Gresham's experiences.

The Strategy

The partners agreed that alleviating Bekasi's traffic congestion should be a priority focus.¹ Gresham officials first visited Bekasi in July/August 2001. After spending time learning about the situation and familiarizing themselves with the host city's resources, the partners drafted a work plan for transportation that included two components:

- Review, refine, and confirm the existing transportation plan, and identify and prioritize transportation projects needed;
- Implement transportation modeling in a pilot area in the city's center and use it to evaluate project alternatives.

The Gresham officials recognized that any efforts to implement transportation changes in Bekasi would only succeed if they took into account significant cultural issues that affected transportation planning. To help learn about core issues, the Gresham team toured the city streets with transportation managers and engineers, met with officials in related departments, and interviewed street vendors and pedestrians. The conclusion was that Bekasi had the potential to make significant progress in resolving its traffic issues. Bekasi's traffic engineers had advanced degrees in traffic engineering and understood traffic management concepts. The Bekasi transportation department also had some of the requisite software, but the engineers had no computer access.

Bekasi needed a transportation plan that would take into account the cultural context in which the city's traffic engineers operated. Bekasi had little experience with involving citizens in decision making, for example. The city simply made changes and then observed people's reactions. City officials believed that democracy meant avoiding anything citizens might oppose, and thus hesitated to make any changes that might be controversial—for example, addressing the issue of street vendors, whose presence was exacerbating the traffic problem.

“Our partnership built bridges between us. It was important to understand that our concerns as city officials are the same, even though the context is different.”

John Dorst, Gresham's Deputy Environmental Services Director

At face-to-face meetings, the Gresham team learned more about the challenges underlying Bekasi's transportation problem. As the Bekasi and Gresham team members got to know one another and discussed common concerns and their potential solutions, they slowly built trust, not only in one another but also in the city's potential to address Bekasi's transportation problems.



Open communication revealed that the success of the transportation component needed more than a technical solution. There were several priority areas that were key to relieving congestion, but any measures taken would need to take into account cultural issues. Moving street vendors, for example, was more than a question of logistics; it required changing the way things had been done in Bekasi for generations. It also required overcoming the government's fear of trampling the rights of citizens and inciting an uprising. Such elements were not addressed by the Australian and Japanese studies, whose proposed solutions were thus inadequate because they ignored the problem of the street vendors, failed to identify other key strategic elements, and—most significantly—didn't help Bekasi managers and staff understand how to effect change in a democratic setting.

Addressing Transportation Priorities

Early on in the partnership, the careful work in building trust and understanding how the transportation planning tools could be used in Bekasi began to translate into specific changes. Working together, the teams took several significant steps toward addressing traffic congestion, including:

- **Changing the timing of signal lights.** The team identified strategic locations where improvements in the timing of signal lights would have a significant impact. The timing of these signals was set to account for the directional flows of traffic in the entrances to and exits from the toll road and the arterials adjacent to them.
- **Relocating street vendors.** Relocating the vendors who encroached on Bekasi's roadways engendered a long discussion about democracy and how a city government can effect change. Afraid of trampling the vendors' rights and sparking demonstrations and unrest, Bekasi officials agreed on an incremental approach. Following the Gresham team's advice, they relocated 50 to 100 vendors from an area at the base of the main entrance/exit to the toll road—where vendors' stalls contributed to the worst gridlock—to other areas. The benefits were visible almost immediately: less congestion and increased safety. The Bekasi officials were relieved that the change was accomplished peacefully; the demonstrations they had feared did not materialize.
- **Channeling pedestrians.** Local officials also selected strategic locations for pedestrian control. They built a pedestrian overpass over the arterial road at the west tollgate entrance, which hundreds of people crossed every hour during the day, and installed several thousand feet of fence to prevent pedestrians from crossing the highway at undesignated places.

As the Bekasi team succeeded in implementing the changes recommended by their Gresham partners, they gained confidence to make and implement decisions on their own.

Transportation Modeling

After observing Gresham's transportation management system, Bekasi submitted its transportation data to Gresham for analysis. Gresham uses several state-of-the-art modeling packages to analyze and maintain its transportation system. TrafficWare's traffic signal coordination software, Synchro, proved to be the most applicable, because it could model large transportation networks with signalized and stop-controlled intersections. It could also model special traffic features and modify signal timing based on actual field conditions.

Bekasi employees gathered transportation data, including traffic volumes, time and distance studies, and data regarding delays due to Bekasi-specific vehicles, such as peddle taxis and motorbikes. Gresham transferred the data to its Area Traffic Control System (ATCS) software to determine where improvements could be made in traffic flow, and worked with Bekasi to adapt the software program to local conditions, making modifications for driving on the left side of the road and adding information about pushcarts and bicycles, which affect lane capacity.

The Gresham team then trained Bekasi transportation staff to use the model. Based on field observations, additional modifications were made to the model, and signal timing plans were developed for pilot areas. Participants in the training also generated a list of possible traffic mitigation strategies.

Bekasi officials also learned of other technologies that could be used to help make transportation improvements. A hands-on presentation of Gresham's Geographic Information System (GIS) provided Bekasi staff with ideas for new ways to use their own GIS. The team also visited Portland's Traffic Operations Center, which is shared by several jurisdictions. Bekasi officials recognized that a similar shared system would greatly enhance the efficiency of the transportation network in the Bekasi-Jakarta region. After visiting a signal control room in Gresham, the Bekasi team set aside a similar room in its own city for controlling traffic signals and dedicated a floor of a local government building for its traffic management department.

Using Modeling to Make Transportation Improvements

Using information from the models, Bekasi's transportation staff began to take the initiative in applying some of the concepts learned from Gresham to make other changes to alleviate congestion.

For example, the data showed that Bekasi's most deadly intersection (with about 50 traffic-related deaths per year) was one where a main road crossed four rail lines in a "blind" situation where the trains were not visible to drivers. Trains on the main line to Jakarta passed this intersection every five minutes, which also routinely contributed to traffic delays of one to three hours. To address the problem, Bekasi built an underpass under the tracks, using a combination of its own funds and a grant from the central government.



Bekasi officials also worked with their Gresham counterparts to relocate the Bekasi bus terminal. Since most of the buses were used for inter-city travel, Gresham officials recommended relocating the terminal to the outskirts of the city. Bekasi officials used the modeling software to study alternate traffic flows and impacts of alternate sites.

The traffic modeling software helped staff identify key bottlenecks and prioritize proposed projects. Bekasi approached the developers of a proposed new shopping mall and convinced them to add, at their expense, a pedestrian overpass between two large new shopping malls on each side of the arterial road.

“The lesson is to look at the layers of a problem. In this case it was societal, cultural, engineering, and civics-based. We came to evaluate a problem, and ended up learning about the process of democracy and how to better problem-solve. And we made some wonderful friendships with our Indonesian counterparts.”

John Dorst, Deputy Director of Environmental Services, Gresham, Oregon

In addition, the Gresham and Bekasi teams looked at how altering curb, sidewalk, and street alignments could impact traffic flow and then made such changes in five Bekasi locations, including converting two adjacent roads into one-way streets. The result was a significant reduction in the time it took to get through the intersections, which had typically taken 45 to 60 minutes to cross and now took no longer than five minutes, with an average wait of just one minute.

Results and Sustainability

The solutions Bekasi has employed thanks to its partnership with Gresham—such as retiming traffic lights, relocating street vendors, and changing traffic patterns—are saving residents and businesses more than 150 million person-hours of travel time annually. Delays on the toll road and arterials that once took hours are now less than 20 minutes; and trips down on other streets take only minutes, in contrast to the hours they took before. The result is less fuel consumption and air pollution and, more significantly, safer roads.

Since the partnership ended, Bekasi has continued developing its plans to relocate its main intercity bus terminal. Seven potential sites were evaluated with the help of computer modeling, and a location about one mile from the toll road gate on the eastern edge of the city was finally selected. Of the site's fourteen hectares, 5 have been allocated for the bus terminal and nine for commercial use (primarily shopping centers) for cross-subsidy purposes. The city plans to use the old terminal for city buses.

Bekasi officials are committed to continuing to use the skills and insights they learned from their Gresham friends, as well as the new technology, in the future. By installing the traffic management and analysis software and dedicating staff and a room for the traffic management department, Bekasi has taken steps to ensure that these systems and techniques will be sustained.

Bekasi staff has newfound knowledge and skills that will allow the city to look strategically at its traffic problems and analyze alternative solutions. City officials have also learned how to effect change in a democratic system. They have new confidence to make convincing cases for funding to the appropriate authorities and to obtain public support to implement needed improvements. "The best result, for us, was to see the changes they carried out on their own, after we left," says David Rouse, Gresham's environmental services director. "Before, the city [of Bekasi] would build improvements and then see how people would react. Their view of democracy was [that] you couldn't do anything if people protest. Officials are still responsive to public opinion, but now they seek public involvement on the front end." Having proven its value, the transportation initiative is continuing under a new administration.



Lessons Learned and Shared

The Bekasi and Gresham teams shared their achievements and lessons learned with fellow local government staff and community representatives at a local best practice symposium held at the final city exchange in June 2003. The teams also presented their successful case study to more than 150 participants representing all U.S. and Indonesian Resource Cities partners as well as Indonesian government associations, donor organizations, and representatives of other Indonesian cities at the National Innovative Practices Conference held in Jakarta in July 2003. The Bekasi-Gresham partners shared the following lessons learned:

- Reliable data is critical to being able to analyze traffic patterns and address existing and potential problems.
- Simple solutions can yield dramatic results.
- Smooth-flowing traffic can improve the environmental and public health aspects of citizens' lives and realize cost savings for citizens (e.g., by reducing time, gasoline, vehicle wear and tear, and accidents) and the city (e.g., by reducing the need for environmental cleanup and repair of streets and other infrastructure worn down by heavy traffic and pollution).

Results and Sustainability

- Relocating street vendors, retiming traffic lights, changing toll road lane configurations, and altering streets and sidewalks has unclogged bottlenecks and is saving residents traveling to and from Jakarta more than 150 million hours annually in total commuting time. Traffic data shows that more than 400,000 commuters have benefited from these improvements, with each commuter saving an average of one to two hours per day. Reduced commuting time leads to reduced oil consumption and air pollution.
- Bekasi has selected strategic locations for pedestrian control. It has built a pedestrian overpass over the arterial road at the west tollgate entrance, which hundreds of people crossed every hour during the day, and installed several thousand feet of fence to prevent pedestrians from crossing the highway at undesignated places. The city has also convinced developers to add (at their own expense) a pedestrian overpass between new shopping malls on each side of an arterial road.
- Bekasi has built an underpass where a main road crossed four busy rail lines at a blind intersection. Data showed that this deadly intersection had resulted in about 50 traffic-related deaths per year, in addition to regularly causing traffic delays of several hours. The underpass will make the road faster and safer.
- Bekasi officials have identified a location for a new intercity bus terminal on the outskirts of the city, using what they learned from the Gresham team to evaluate potential sites and select the one that's most appropriate. The city is currently in negotiations with an Indonesian private developer on sharing expenses and revenues.
- Bekasi staff now knows how to collect and analyze data about such things as road conditions, traffic volume, and accidents. Using the modeling software introduced by Gresham will allow Bekasi to continue to look strategically at its transportation problems and to develop feasible solutions.
- Bekasi has installed traffic management and analysis software and dedicated staff and a room for a traffic management department—steps that are integral to sustainability.

The transportation tools and systems used by Bekasi could help other local governments identify specific transportation problems and improve their traffic patterns. The modeling software may be particularly applicable to the suburbs of Jakarta, Surabaya, Bandung, and other major cities in Indonesia, but any local government faced with a major traffic or land-use planning crisis could benefit from Bekasi's experience and a computer analysis of its problem.

Conclusion

Traffic congestion is a common problem faced by municipalities worldwide and one of the priority issues selected by several *CityLinks*'s partnerships. The partnership between Bekasi, Indonesia, and Gresham, Oregon, tackled this complex problem in a large metropolitan area and made a dramatic difference in a short time. The specific measures the partners introduced—data collection and traffic modeling—are inexpensive solutions that can be used to prioritize existing problems and evaluate proposed alternatives.

Success in addressing traffic congestion depends on more than just computer analysis and a written plan, however; it requires an understanding of the cultural context in which proposals will be introduced. Change—even if it is for the better—is often difficult. In Bekasi, relocating street vendors was an issue of concern to local officials, who feared it would cause considerable unrest. A phased-in approach enabled the city to ease its way through the process and test the solution over time. A partnership that allows localities to build understanding and mutual trust can help them craft a solution that not only focuses on the technical problem but also overcomes very real social and cultural obstacles.



Endnote

- 1 Transportation was just one of two issues the partnership addressed, the other being financial management and accounting.

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