

***“POR EL FUTURO, USEMOS BICICLETAS”***

**FEASIBILITY STUDY  
FOR A CYCLING NETWORK  
IN MANAGUA**

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# **1. INTRODUCTION**

## **1.1 OBJECTIVE OF THE STUDY**

This following study considers the potential of providing a cycling infrastructure for the city of Managua. It will evaluate the feasibility of implementing such an infrastructure from a comprehensive planning perspective, not only looking at physical elements, but also at the wider socio-economic and administrative context of planning for such a new transport infrastructure.

The most immediate and concrete purpose of the study is to provide interested government officials and potential international funders with the necessary information and focus they would need to initiate the official planning process for implementing a non-motorized transport infrastructure program for the City of Managua. In order to foster a dialogue on this particular subject among policy makers and international donors, this feasibility study is to be distributed to numerous experts in Nicaragua for review and comment. It is also intended to be a centerpiece of discussion at a conference organized by ITDP, UCA and UNI in the summer of 1997 on sustainable transportation for Nicaragua. In a more general sense, this study forms part of ITDP's larger effort to promote environmentally sustainable and equitable transportation in Nicaragua.

## **1.2 RATIONALE: WHAT OPPORTUNITIES OR NEEDS INSPIRED THIS STUDY?**

### **1.2.1 The Big Picture: The World-Wide Motorization and Mobility Crisis**

The planet is facing a motorization and mobility crisis. The unsustainable use of motor vehicles increasingly threatens the livability of human settlements. Motor vehicle growth in developing countries is at an explosive 220% increase per decade. Latin and Central American motorization rates are increasing particularly rapidly. The overall rate for the region is 68 cars per 1000 people, compared to 561 in the US, 14.2 in Africa and 1.48 in China. Pollution and congestion from motorvehicles have become unbearable in many cities, and road transport is often responsible for 70% to 86% of total airborne urban pollutants, and for grave health and safety impacts. For example, airborne lead and carbon monoxide has caused abbreviated mental development in 7 out of 10 children in Mexico City. Worldwide, more than 500,000 people every year are killed in road accidents, while another 50 million are seriously injured. In developing regions like Central America, the vast majority of these victims are pedestrians and other vulnerable, non-motorized road users.

Much damage could be avoided if governments fully embraced an alternative development path, one that emphasizes livable cities, affordable mass transit, the use of human powered vehicles and modern telecommunication. Unfortunately, most developing country political leaders are still more influenced by unsustainable Western patterns of automobile dependence, and Latin America has become a prime export market for US, European and Japanese automobile manufactures and road construction firms. Policy makers are also mobilizing increasing private sector support in order to finance toll roads. Meanwhile, the vast majority of people in South and Central America are dependent on public and/or non-motorized transport. The poorest people, who live at the fringes of big cities often commute for hours, sometimes walking for miles every day to reach urban job

markets. The transport and mobility needs of Latin America's poor are not sufficiently addressed by the current transportation systems and plans.

### **1.2.2 Sustainable Transport in Nicaragua: Managua as the Capital Challenge**

In a country like Nicaragua, with severe poverty and unemployment rates at 70% of the economically active population, affordable access and mobility become key issues for stimulating economic activity and the promotion of sustainable development. Due to natural disasters and decades of political turmoil, Nicaragua has not been able to develop its transport infrastructure to the same extent as other Central American countries, which considering current unsustainable development patterns has been a blessing.

In the late eighties, unable to adequately improve the performance of its road-based mass transit system, especially with the US embargo in place, the country followed the example of Cuba and began to promote bicycles as an efficient and affordable mean of transportation. Cycles were introduced into the market on a large scale at affordable prices. Although this was done for economic, rather than environmental reasons, this still holds exceptionable promise for the development of a more environmentally friendly and efficient transport system. As a matter of fact, cycles in all forms and fashions are widely used in Nicaragua's secondary cities and towns.

In the city of Managua, however, which is home to about one third of all Nicaraguans by now, cycles are not a very common sight on the streets, because they are the most trafficked, the most dangerous, and the most polluted in the whole country. Like so many other capitals of the world, Managua is the largest and most problem-ridden city in the country, and its current transport system is both inefficient and environmentally unsustainable.

Improving the situation, however, is not so much matter of economic means than of political will and careful planning. Transport planners and political decision makers should take advantage of the "window of opportunity" which Managua's currently deficient transport system represents. This study outlines a possible point of departure towards a more sustainable future.

### **1.3 ORGANIZATION OF THE STUDY**

This study is organized in seven parts. Following this introductory section, a more detailed overview of the current transport situation in the city of Managua is presented. Chapter Three then demonstrates some of the practical uses of cycles in Managua, showing their usefulness in the educational, commercial and public service sectors. Chapter Four evaluates the enabling and constraining factors for building a cycle network in Managua, looking at various environmental, social, political, administrative, economic and physical aspects. The following two chapters are more concretely concerned with the actual construction of a cycle network, with Chapter Five laying out the basic program requirements for developing such an infrastructure, and Chapter Six giving specific planning recommendations for its implementation. Several maps and illustrations accompany this section. The final section contains concluding remarks.

## **2. TRANSPORTATION IN MANAGUA TODAY - AN OVERVIEW OF THE CURRENT SITUATION**

Almost all transport in Nicaragua today is road based. Rail-based transport was terminated in Nicaragua at the beginning of the decade. Water-based transport plays a somewhat significant role for international shipping, as well as in the sparsely populated Mosquito region, along Rio San Juan, and around Lake Nicaragua, but not as much in the Lake Managua region. Air-based transport is important for international travel. There is also national service between the capital in the West and Bluefields on the Caribbean coast.

Throughout the eighties, the size of Nicaragua's motor vehicle fleet was relatively stable at about 30,000 vehicles. After 1990, however, when the newly-elected Chamorro government opened the country to Western imports again, Nicaragua's vehicle fleet more than doubled, from 31,162 in 1990 to 67,486 in 1992. This figure was soon doubled again, and today, there are about 170,000 motorized vehicles in Nicaragua. At about 10% a year, motorization growth rates for Nicaragua are comparable to other Central American countries. Nevertheless, with about 40 vehicles for every 1000 inhabitants, motorization rates are still comparatively low. (The US has almost 600 vehicles per 1000 inhabitants) The vast majority of Nicaragua's 170,000 vehicles are imported second-hand vehicles from the US. There is also a significant number of old Soviet models. Very few vehicles are new.

About 70,000 to 80,000 vehicles, or 40 to 45 per cent of the total vehicle fleet of Nicaragua circulate around Managua. Given that Managua is home to about one third of the entire Nicaraguan population, or about 1.4 million people, this means that motorization rates are comparatively higher in the capital. However, the vast majority, about 95 percent of Managua's population, do not own private vehicles, and are thus mostly dependent on public transportation.

### **2.1 MANAGUA'S PUBLIC TRANSPORT SYSTEM: AN INADEQUATE ALTERNATIVE**

The present public transport system of Managua is clearly unable to meet the existing travel demand of its urban population. A 1994 public transport survey by the municipality of Managua put the city's urban public transport fleet at 954 units, 58 of which were illegal operators. Even many of the authorized, legal vehicles do not meet the minimum health and safety standard, and in 1994, 20 percent of the public transport units were in serious need of improvement or even replacement, plus another 65 percent which were in need of various other improvements. Together, these units still managed to satisfy the demand of 680,275 daily transport users, but this represented then only about 54 per cent of the total population. This means that the transport demand unmet by public transportation in 1994 was at 46 per cent.

The city itself estimated in 1994 that at least 1250 units would be needed to efficiently cover existing demand; adjusted for 1997 this should be about 1,300 units. Of the units counted in the 1994 survey, only 137 were Pegasus-type buses serving 5 lines. The rest were other buses and minibuses (624 units), or camiones and camionetas (193 units).

Managua's buses are notorious for overcrowding, making the squeezed passengers prime targets for pickpocketing. In a recent survey, about half of all public transport users in Managua reported having been attacked and/or pickpocketed during the last year.

Besides the lack of capacity and safety, another major problem with the public transport system is the organization of the routes, which displays a great lack of coordination and integration. Almost all the major lines go east-west, right through the major commercial and educational centers which generate the largest volumes of passengers. The fact that most buses transverse these bottlenecks twice during every round trip, rather than beginning and ending their routes there, results in almost continuous congestion and delays at these strategic points. The six major traffic hubs in the city of Managua are: Siete Sur (237 buses generate 84 to 130 daily round trips), Mercado Boer (with 327 buses generating 101 to 130 round trips), UCA (314 buses and 84 to 130 round trips), Mercado Roberto Huembes (302 buses, 92 to 146 round trips), Mercado Ivan Montenegro (408 buses and 90 to 146 round trips), and the Mercado Oriental (560 buses and 88 to 138 round trips).

The fact that the public transport system is largely organized along east-west, and to a lesser extent along north-south lines, also has important cost ramifications, because it raises the number of necessary transfers for diagonal travel. The fare system of the public transport fleet in Managua is at one single unified fare (currently about 13 cents) for each separate trip taken on a bus, no matter how long or short the person stays on the bus. This means that any person moving across Managua to educational or job facilities diagonally by public transport lives in a virtual two-fare zone, i.e. has to pay for two trips rather than one each way, paying a total of four fares round trip just to get to and from work. Especially women are likely to have to pay even more than four fares in order to satisfy their travel demand, because they generally have additional household responsibilities like going to markets, or accompanying children and elderly relatives to health and educational facilities,. The figures of the 1994 public transport survey (*diagnostico*), however, indicate that the 4,025 daily round trip trips made by public transport vehicles only result in an indicator of 3.2 trips per inhabitant.

Finally, the 1994 survey also revealed that the distances between stops on most routes are too far apart, most exceeding 500m, while the recommended distances is between 300 to 500m. Ideally, people should not have to walk more than 350m to the nearest stop in their neighborhood.

In sum, while the existing public transport network of Managua covers the expanse of the city, the service provided is vastly inadequate, because it is unsafe, congested, and lacks coordination and density.

## **2.2 ALTERNATIVES TO PUBLIC TRANSPORT**

The seriousness of the transport situation in Managua becomes even more obvious if one considers the few available alternatives to public transport in the city, which consist of taxis, private motor vehicles, non-motorized vehicles, and of course walking.

### **2.2.1 Taxis**

There are a considerable number of taxis on the streets of Managua, but at 10 to 15 cordobas they are about ten times the price of a bus fare and thus prohibitive for much of the population. Fares are only roughly proportionate to the distance traveled, by the way, as there are no taxi meters. Shorter distances are relatively more expensive. Nevertheless, for the ones who can afford them, taxis provide relatively fast, and convenient access to all locations in Managua. The 1994 survey counted 2,400 taxi units on Managua, which were owned either by companies or cooperatives, together transporting about 60,000 passengers per day. But even if one estimated that there are about 3,000 units today, this would still only satisfy the transport demand of about 5 per cent of the Managuan population, and given the price, these users are obviously located in the higher income brackets.

### **2.2.2 Private motor vehicles**

Even in the unlikely event that except for the about 1,000 buses and 3,000 taxis all the remaining motor vehicles on Managua's streets were privately owned cars and used by up to three family members every day, this would still only account for about 70,000 cars, serving 210,000 people, which would be another 15 percent of the population. Since in reality, probably up to a third of the vehicles are actually commercial vehicles, including trucks, vans, and other company cars, the actual percentage should even be considerably lower, with private cars probably serving about 5 percent of the population.

### **2.2.3 Non-motorized vehicles**

The above calculation means that, at the very least, 25 per cent, or about one fourth of Managua's total population is not served by any form of motorized transport, and is thus entirely dependent on walking or other forms of non-motorized transport. This is a conservative estimate, the actual percentage is likely to exceed 35% or over one third of the total population, because although some people, like pre-school children and older, disabled people, may not use the transport system every day, most of the actual users make more than one trip per day (see above).

Non-motorized vehicles exist mainly in the form of animal drawn carts and cycles in Managua. A frequently observed use for both cycles and horse carts is for load carrying, rarely for individual travel alone. Unfortunately, while there are anywhere between 75,000 to 100,000 bicycles in Managua, only a small fraction of them are currently used on a daily basis.

The physical conditions for cycling in Managua's current transport chaos are so threatening that the vast majority of bicycle owners currently do not consider travel by bicycle as a safe and convenient option. Most bicycles thus quietly rot away in back yards or garages, or are only occasionally used as recreational vehicles on weekends.

With unemployment still rampant at 70% and few opportunities for formal employment, there are, however, an increasing number of people who use both tricycles and cargo bicycles as their (informal) workplace, to carry, deliver and sell various products, anything from newspapers to bread. Economically desperate, these people are willing to risk traveling by bike on Managua's streets only because it is their only option of earning a livelihood.

#### **2.2.4 Walking and Headloading**

Pedestrians are a major presence in all areas of Managua. Many people, especially women, can be seen walking alongside major roads headloading food products for sale. A smaller number of people have access to small, two-wheeled handcarts. Since most streets in Managua have no or only very deficient, partially-built sidewalks, most pedestrians are constantly forced to walk at the edge of the streets, thus exposing themselves to the fast moving, frequently swerving motor vehicles.

Both pedestrians and people using non-motorized vehicles are obviously the most vulnerable road users, yet no adequate protection is provided to this large and important transport user group.

### **2.3 REGULATION OF TRAFFIC AND THE ALLOCATION OF ROAD SPACE**

The fact that non-motorized transport users are presently not protected in any form in Managua is in part connected to the fact that Nicaragua's Ministry for Construction and Transport, MCT, which is the major body in charge of road and transport planning in the country, does not consider the regulation of non-motorized transport within its field of action. Further exacerbating this situation is the fact that Nicaragua's traffic law dates from 1938 and has not been changed or updated in order to take into account the increasingly complicated, crowded transport situation and greater differences in travel speed among different transport users. Existing traffic signalization is also largely inadequate, with about half of the normally needed signs missing or incomplete.

The lack of protection, in the form of traffic lights or protected lanes, make it particularly dangerous for slow-moving, non-motorized vehicles to try to cross major intersections. Left turns from two- onto single-lane streets are especially nightmarish, because if the non-motorized users try to use the provided left lanes for turning, they are hidden from view for crossing traffic from the right by the vehicles next to them, and since without traffic lights vehicles largely operate on a first come, first move basis, non-motorized users are thus forced to either switch to the right side of the street first and then double-cross like pedestrians would, or use the left lanes and emerge behind the vehicle to their right side fully exposing themselves in the middle of the intersection with little time for crossing and oncoming traffic to react.

Presently, nowhere in Managua are there any cycleways or even special signs for non-motorized users or pedestrians, not are there any pedestrian zones (except for the park at the Malecon maybe).

What is even more surprising is that although the about 1000-unit strong public transport fleet of Managua is responsible for moving about half of the population in Managua every day, thus

forming the backbone of the transport system for the vast majority of the users, no special lanes are allocated to public transit vehicles in Managua. So along major arteries, the 90 per cent of the motor vehicle users which are sitting in buses, camiones, and minivans thus get all stuck in traffic jams largely produced by the richest 5 per cent of the population driving in private vehicles.

In essence, road space allocation in Managua is not regulated at all, but operates according to Darwinian principles: usually the strongest motor and/or the fastest vehicle wins, leaving its competitors in a cloud of smoke and dust.

## **2.4 THE ROAD INFRASTRUCTURE AND CONDITIONS**

In 1994 Managua had a road network of 1,105 kilometers, which represented an increase of 14.1 percent compared to 1984. Of this network, 45 percent was asphalt, 20 percent was paving stone or concrete, and 36 percent was dirt roads. These figures excluded dirt roads in bad condition and many dirt paths which spontaneously formed in unplanned settlements.

Road conditions in much of the network are deficient, not only because of lack of timely maintenance, but also due to the extreme overuse of certain roads. Another serious problem is the inadequate allocation of road space in many intersections, where curve radii are so small that bigger vehicles are forced to cross over onto the lane for oncoming traffic in order to be able to turn, greatly adding to the risk of accidents.

## **2.5 ENVIRONMENTAL ASPECTS**

The high average age of the vehicle fleet is responsible for the high levels of air pollution along major arteries. Buses and trucks are especially loud and smoke-belching. Even at a fraction of the motorization rate of cities like Los Angeles or New York, Managua manages to achieve equal or even higher contamination levels along major arteries. For example, a survey done in late 1996 showed that 13 of 15 locations around Managua continuously exceeded the acceptable levels of carbon monoxide pollution according to US EPA (the United States Environmental Protection Agency) and OPS (Organizacion Panamericana de la Salud) health standards, which are at 9 parts per million. Some of the most contaminated sites in Managua are: Metrocentro, with a measured average of 23.6 ppm and a high of 24, semaforos de Rubenia, with an average of 21.7 and a high of 23, as well as Ciudad Sandino (14ppm), Mercado Oriental (16ppm), Nuevo Diario (17ppm), Plaza Espana (14ppm), Mercado Iven Montenegro (15ppm) Mercado Roberto Huembes (11ppm) and Siete Sur (15ppm). Other contamination rates are also considerable. Noise pollution, a completely unaddressed problem in Nicaragua, is particularly penetrating in Managua, where houses are built low and in an open fashion, so as to allow for maximum air circulation, and where most noisy buses and trucks go right through neighborhood streets.

### **3. THE ECONOMIC POTENTIAL OF CYCLES AS A SOLUTION TO MANAGUA'S TRANSPORT PROBLEMS - SOME EXAMPLES**

This section will demonstrate some of the practical uses of cycles in the city of Managua, focusing on the economic savings and environmental benefits of substituting human-powered transport for motorized modes. Examples are drawn from the educational, private/commercial, and public service sectors.

#### **3.1 EDUCATIONAL SECTOR: TRANSPORT COSTS OF STUDENTS**

Transport for students at all levels is neither provided for by municipal nor federal funds. Bussing for students who attend a public school located outside a feasible walking distance is offered at a cost-prohibitive fee of ninety-eight cordobas (about \$10 US) per month, or 2.5 cordobas round-trip at an average 22 days per month. Bicycles (at an average cost of \$96 US), therefore, would recoup their cost in less than ten months, and by the end of five years, save a family with one child roughly \$500 US, the equivalent of fifty months of bus fare. For students attending private schools, where costs for bussing run in the neighborhood between \$120 and \$180 US, the savings would be as many times greater.

Currently bicycles have not been utilized to this end due to factors addressed in more detail in other parts of this study, namely: Dangerous road conditions, high rate of bike theft, and initial investment (purchase of the bike).

Students, whose families cannot afford to pay the monthly bussing fee, are therefore forced to select from greater or lesser dissatisfying solutions. They may walk either one, or both, way(s) to school at distances which might prove a daunting chore each day, especially to a small child. Moreover, there is also the not-so-hidden cost (at least to Managuan locals) of shoes, which rarely last more than a few months. Not surprisingly, delinquency is often a consequence, if not, ultimately, the solution.

#### **3.2 COMMERCIAL/PRIVATE SECTOR: CARGO BIKES AND PULPERIAS**

By its own admission, the current official planning study on transport by the Nicaraguan government does not even consider possible commercial uses, let alone potential economic gains, of bicycles. Yet, unqualified successes and benefits provided by incorporating bike-use considerations into infrastructure are well-documented. In particular to Managua, wherein much commercial activity is taking place within the "barrios", many such possibilities await exploitation, especially with regard to the use of cargo bikes for delivery to the pulperias. To wit:

"Pulperias" are small convenience stores, most often run out of neighborhood residences. The extreme concentration of pulperias, coupled with the city's relatively flat topography, creates a perfect environment for the use of "cargo" bikes as a cost-effective alternative to the current fleet of second-hand, smoke-belching delivery trucks which now disrupt life in the "barrios" by supplying "pulperias" down every narrow residential street.

But reducing the amount of dangerous traffic in living environments never intended for commercial use is only one reason for introducing "cargo" bikes. If put to proper use, "cargo" bikes might well prove to be much more economical. Because of the high density of pulperias (several to any given city block), delivery routes for supply trucks are relatively compact. Only the initial trip, from distributor to the beginning of a given neighborhood route, makes efficient use of the vehicle.

With Nicaragua's exceedingly high rate of unemployment, which is currently at between sixty and seventy per cent, its low-cost labor (minimum wage is at \$1 US per day), and the cheap market price of "cargo" bikes (the average sales tag is between \$200 and \$300 US), there should be no reason that the use of many non-polluting, low-impact "cargo" bikes would not be a more efficient alternative to troublesome delivery trucks-- and this does not even consider the jobs created in the process.

### **3.3 PUBLIC SERVICE SECTOR: SANITATION AND MAIL DELIVERY**

#### **3.3.1 Cargo Bikes and Sanitation**

Sanitation is presently a grave concern for Managua, wherein the greater portion of the population cannot afford the monthly cost of garbage collection that the municipal government has been trying to impose. Recently, the city government, in conjunction with Italian investors, augmented the former fleet of run-down, overburdened garbage trucks at a cost of \$200,000 US per truck. This cost was hoped to be recouped by the introduction of collection fees, in addition to a 2% municipal tax paid by businesses, to be collected from businesses and private citizens alike. However, poverty and general resistance to the fee has now forced investors and local government to be satisfied with only the 2% tax and additional sanitation fees collected from businesses. Garbage collection in residential areas continues out of necessity; however, not surprisingly, service to private citizens in the "barrios" is both irregular and inadequate.

As a result, private citizens cope with the situation in any manner they can. Often this means simply dumping waste materials in "cauces" (drainage canals) which pollute living conditions along the canals and, subsequently, Lake Managua to which they drain. Another prevalent, no less polluting, solution to the problem of waste is to burn it in the street, along roadsides, or in vacant lots. On any given day, in addition to the extreme heat of Managua's climate, smoke from trash fires fills the city's already exhaust-polluted air.

As a solution to the above problems, "cargo" bikes, used for sanitation collection, could play a major part in facilitating a feasible, cost-effective solution to the current crisis. Officials estimate that Managua would require a fleet of ninety garbage trucks to adequately service the city's needs. At present the city owns only thirty, just one-third that number. Moreover, since funds to purchase additional trucks do not seem forthcoming, "cargo" bikes represent a possible recourse which, even lacking a detailed study, should at least appeal to common sense.

As at issue with "pulperias," it simply is not practical to move big, heavy, loud garbage trucks down narrow, densely-populated "barrio" streets a few feet at a time, like it is in the residential streets of middle-class suburbia in the US. The holding capacity of a "cargo" bike is between five-hundred and six-hundred pounds of uncompacted (not machine compacted)

sanitation, compared to the 6,600 pounds of compacted trash a garbage truck is able to transport. Thus, while there is clearly no eliminating the need for trucks with such enormous capacity, the issue is whether cargo bikes (at a mere 1/1000th the price of a garbage truck!) might better make use of the present number of garbage trucks.

Consider, for instance, if instead of the purchase of one additional garbage truck, one thousand "cargo" bikes were put into service at exactly the same cost (indeed even the yearly savings on fuel and maintenance might be able to recoup additional inexpensive labor costs), these bikes could collect sanitation only among difficult, narrow, "barrio" streets, then transport it to a designated point for pick-up by garbage trucks. Thus, by utilizing trucks only for long-distance hauls from selected pick-up areas their efficiency would not be wasted on small neighborhood routes that are more perfectly suited to the five- to six-hundred pound capacity of "cargo" bikes. Moreover, by eliminating or reducing the amount of house-to-house collection done by trucks, the time saved would increase the capacity of the current number of trucks and make them more fuel-efficient and thus cost-effective.

Hence, as with the case of "pulperia" delivery, "cargo" bikes used in sanitation collection would potentially not only improve quality of life in the "barrios," but also be more cost-effective and create jobs in the process.

### ***Present City Politics On The Issue***

Despite claims of city officials, in person and in official documents on policy, which have stated that bikes do not play an important role in Managua's transportation network, "cargo" bikes used in this capacity does seem to have at least crossed the minds of city officials. Samuel Barreto, a private architect regularly employed to develop municipal projects, reports that he was approached by the city government with a sanitation project which included considerations for "cargo" bikes. Ultimately, he did not choose to undertake the project upon learning that his time would not in any way be remunerated. However, the aspirations of such a project could not be corroborated by any source within the city. Incidentally, this contradiction in transport planning policy is clearly and elsewhere evident by virtue of its employ of bikes for the greater part of their mail delivery network, as will be discussed in the section to follow.

### **3.3.2 Use of Bikes For Mail Delivery**

According to the Vice-Minister for the Ministry of Transport Construction (MCT is the Spanish acronym), bikes are not considered a mode of transport due to the impracticality of the long commutes necessary for Managua. The average trip, he estimated from his experience coordinating the cooperative public bus system, was approximately 26 kilometers. However, even as bike transport and bike use is viewed by the city planning community as unfeasible and left unconsidered in the design of the city's transportation network, each day the greater part of the nation's mail is delivered in Managua by couriers on bikes. Though specific numbers with regard to volume are difficult to attain, the predominance of bike delivery to other modes is clear both from the testimony of officials with the mail service, and from the base operations of a typical station. A typical post office might utilize a mail delivery truck, one or more motorcycles, and twenty-some bicycles to service its assigned region.

The importance of this fact is obvious. Clearly, the transport needs of the individual (to and from home, work, the market, or school) is not the only critical factor in considering the potential practicality of bike use in planning the city's transportation network. Moreover, it provides a counter-argument to claims of city officials: bikes are already an important economic determinate with regard to the operating costs of the postal service. How could you, for example, as efficiently replace couriers presently on bike? Additionally, the principle in effect here could be cited as a successful model for proposals described in the sections above.

### **3.4 SOME CONCLUSIONS**

The preceding examples and arguments were not intended to be exhaustive, but to merely evoke the presence of very real and often overlooked economic advantages of developing infrastructure conducive to bike use. To this end, possibilities specific to the problems and conditions in Managua were considered.

Too often it is the expense of a bike-lane project, weighed only against clear environmental and recreational advantages, which jeopardize the realization of infrastructure which would as greatly benefit the city's economic health.

## **4. IS THE VISION FEASIBLE? CONSTRAINING AND ENABLING FACTORS FOR BUILDING A BICYCLE NETWORK IN MANAGUA**

The following chapter will give a more thorough analysis of the constraining and enabling factors for building a bicycle network in the city of Managua, looking at the various environmental, social, political, administrative and economic aspects which determine whether or not such a system has any prospects of ever being planned and executed.

### **4.1 THE SOFT FACTORS: SOCIAL POLITICAL, ADMINISTRATIVE AND ECONOMIC ASPECTS**

#### **4.1.1 Social Aspects**

There are two main social deterrents to bicycle use in Managua, which are fear of crime and fear of accidents. Both fears correspond to real physical dangers, as both the likelihood of being robbed and the likelihood of being hit by a motor vehicle are rather great in the city of Managua. Regarding crime, fear of petty crime equally extends to the public transport sector, where pickpocketing is rampant. Everybody holds on to their bags tightly when riding in a public transport vehicle in Managua, and any larger bills are best hidden in socks, as pockets in clothing are sure to be cleaned out. Pedestrians and bicyclists, however, are more vulnerable to violent physical attack, and cyclists run the additional risk of getting their vehicle stolen, especially at night. There is little traffic on the streets after ten o'clock, when all public transportation has stopped.

However, during the day and along major avenues, crime is much less of a problem than traffic. Although the number of total vehicles is relatively small compared to the total population, most of them run along several major arteries. Buses are constantly stopping at various point of the roads, with other vehicles swerving around them, trying to pass each other on both sides. Many vehicles even switch into the lane for oncoming traffic for passing other vehicles, or they skim the shoulder or curb at the extreme right of the road, which is particularly dangerous for cyclists who mostly ride in this area.

There is hardly any special traffic education for drivers in Nicaragua at present, although thanks to recent efforts of the national transit police, this may soon change somewhat. The lack of traffic education is to a significant part responsible for the accident rates on Managua's roads, and the cyclists' usual situation of extreme vulnerability is thereby exacerbated even further.

The danger of the present traffic situation for bicycling is clearly the single most important reason why more people do not currently make use of the bicycle as their means of transport. This was the univocal opinion in all of our informational interviews, and also the overwhelming response in the cycling survey which FUNCOD carried out in January and February 1997. Asked to name two major disadvantages to riding their bike in Managua, 78 of the 78 cyclists surveyed, that is 100%, named the physical danger of riding in Managua traffic. And these were all people who certainly knew what they are talking about, as all of them were riding their bicycle along a major traffic artery in Managua when they were asked to respond to the question.

Apart from these justified concerns about riding a bike in Managua, attitudes towards bicycling are very positive in Managua, as they are in Nicaragua in general. Almost every person

interviewed said that their reservations about cycling were mostly restricted to Managua, and most were aware of and sympathetic to the fact that bicycles are a major mode of transport in many other, smaller Nicaraguan cities. Contrary to many other Latin American countries, the bicycle does not have an big image problem in Nicaragua, although cars definitely remain major status symbols.

Especially for teenagers and university students, the bicycle has much appeal, particularly since the advent of the mountain bike era. When bikes first hit the streets of Nicaragua in the eighties, most models were Indian or Chinese bicycles, which arrived in CKD (completely-knocked-down) packets and were assembled in country. Most of them were Atlas and Hero bikes with large frames which are too big for children and youth, and which also look more old-fashioned. There are also a good number of second-hand imported ten-speeds, but most of the newer models are now *montaneras* i.e. mountain bikes. The two major bicycle factories in the Managua area, *Tierra* and *Shannon y Candy*, both mainly import parts from Taiwan. Shannon O'Reilly mostly produces mountain bikes, while the Tierra factory in Jinotepe also produces various cargo bikes, which are popular all over Nicaragua.

Probably the most frequent use of bicycles in Managua today, is for small load carrying. These small vendors, who are almost exclusively male, generally strap one plastic crate in the back and sometimes one in the front. These vendors are aware of the dangers of riding the bikes in Managua traffic, just as much as other users, but state that selling and delivering small products with the bikes was their only employment opportunity, so they took the risk of getting hurt.

#### **4.1.2 Administrative and Planning Aspects**

##### ***Transport and the Administrative Structure of Managua***

Compared to cities in other countries, Managua has comparatively few administrative responsibilities. There is no municipal or state police force for example, and even fire departments, schools, universities, and utility companies are organized on a country-wide level, so that the City of Managua is more or less only left with sewerage, waste collection and public infrastructure as their main responsibilities. The latter mainly includes public parks, and open spaces as well as streets and sidewalks.

Government Law No. 40 specifies the responsibilities for transportation infrastructure and planning for Managua in more detail. Curiously, the responsibility for the actual road network, the streets, sidewalks, traffic intersections, rotundas and other physical infrastructure within the city are with the city government, but all regulating functions, such as taxi licensing or bus authorization are the responsibility of the (National) Ministry of Construction and Transport. In practice, the two institutions are always working very closely together, but officials regard the current regulation as somewhat awkward. There is already a special Council of Cooperation between the City, the MCT and the Transit Police, and there are plans to increase the decision-making power of this commission and have all transport-related plans be approved by this joint commission in order to better integrate the planning process in the near future.

In January 1997, the new mayor reorganized the administrative structure of the city of Managua, dividing it into eight different districts (with one Vice-Alcalde each) instead of 7 before

(at one time there were even over 20). The districts all have the power to approve smaller development projects (up to 100sqm), but all bigger projects have to be planned and approved in coordination with the main city planning office.

There also were some other administrative changes. For example, a new post, the "Secretario General de La Alcaldía," (Secretary-General of the Mayor's Office) was created to support to mayor in his day to day work. Sr. Ing. Adolfo Diaz, who previously already was the assistant of the mayor, currently holds this new post, which is basically a right hand to the mayor. (This new position is not to be confused with the already existing Secretario General del Consejo Municipal, which is the general secretariat for all the various municipalities of the country, which is in a sense superior to the Mayor of Managua.)

Another new post created in mid-May is the one of a transport specialist as a high-level advisor to the planning department, currently held by Sr. Ing. Victor Valdives Heralgo, whose support also would be essential for the implementation of a bikeway network.

There are actually two different city offices which have relevance for transport development and planning:

- 1) The Directorio General de Planificacion (City Planning Department) which is subdivided into
  - Economic planning
  - Physical planning
  - External cooperation
- 2) The Directorio General de Desarrollo (City Development Department) which is subdivided into
  - Urbanism (which includes zoning and land use)
  - Municipal Development

### ***Current Transport Plans for Managua***

Regarding the current planning situation, there is an official development plan for Managua from the year 1992 which is officially still valid, but already obsolete in reality. Both the different districts and the city are struggling to keep up with planning reality of the rapidly growing city. The city is currently terminating the final parts of another city-wide "diagnostico" (needs assessment survey) which is to form the base of the new 20-year development plan for the general city, the Plan General de Desarrollo Urbano de Managua, or PGDU, 1995 - 2015, but -- as the once again already outdated time-frame indicates -- spontaneous, unregulated activity always outpaces the municipality's ability to actually plan for organized land use and regulated development.

The only existing specific plan with reasonable prospect of being executed in the near future is the plan for the redevelopment for the city center, which was completely destroyed by the 1972 earthquake and with the exception of a handful of buildings still has not been rebuilt, but mainly exists as open wasteland. Administratively speaking this area has been designated as district No.1. Finally, an extensive diagnostico for this central area was finished in 1991 by the City of Managua, with the active support of the City of Amsterdam, which has a strong sister city program with Managua, and maintains a permanent office in Managua giving direct technical assistance to the

city planning office. Again with strong Dutch support, the Plan Maestro de la Area Central, or PMAC was published in 1994 by the City and since awaits execution.

Besides giving quite detailed information about future zoning and land use in the areas, the PMAC also contains vital information with respect to the transport sector. It contains a detailed overview over the new hierarchization of the street network, which any bikeway network has to take into account. The main east-west traffic corridors according to the PMAC are the Dupla/ Carreterra Norte, the Radial Salvadoe Allende from Montoya to Estadio, continued east by the Dupla Sur to El Novillo, continued by the Radial Santo Domingo via Gancho de Camino, and the Calle Colon. Along north-south lines, the main corridors are Avenida 11 S.O, followed by Avenida 12 N.O. north of the Stadium (then actually turning west along Calle Triunfo), Avendia Bolivar, connected with Ave 5 N.E. south of the Laguna de Tiscapa via the Paseo Tiscapa, and finally the short stretch of Avenida 10 N.E. between Parc Bartolome and El Novillo, and Ave 16 N.E. at the eastern edge of the district.

Parallel to these main corridors, which are to be designed as boulevards and grand avenues with wide sidewalk promenades and ample vegetation, there are plans for four different pedestrian streets: one along the Malecon -- or Paseo Costaneo as it is also called -- with a more recreational character, one along Paseo Corredor which is as a main commercial strip, and further two more along the Paseos de la Paz and Sandino. In addition to these non-motorized streets, a series of parks are planned in the areas, making walking, and hopefully biking much more pleasurable in the area.

Although no specific plans presently exist for an extensive bike infrastructure, the present plan can certainly easily accommodate such an infrastructure. The fact that Dutch planners are advising the city on further concretization and execution of the PMAC is an additional plus for the prospect of bikelanes, given the strong political, moral and financial support the Netherlands have given to bikeway planning in the past, both in their own country and abroad.

### ***Japanese Assistance for Transport Planning in Managua***

Special hope for the development of a more modern, coherent and integrated transport plan for the city of Managua is to be expected from the fact that the Japanese Agency for International Cooperation, JICA, has recently taken an active interest in helping the municipality and MCT with the development of their road infrastructure. In April 1997, a first mission from Japan met with government officials, and the municipality is expecting another, more extensive visit in August/September with a good possibility that the Japanese will help funding a longer term transport development study costing up to US \$1 - 1.5 million.

The Japanese are particularly interested in road construction, bridge and tunnel building, and are already cooperating extensively with MCT on various road sections outside Managua on several bridge projects. Approaching the Japanese for support for a bike plan may offer unique chances for environmentalists, bicycle advocates, and sustainable transport experts to get concrete elements of a bicycle infrastructure included in future transport planning in the city of Managua.

Japan has one of the most impressive cycling infrastructures in the world, with millions of bicycles being used every day for commuting and recreational purposes. Japan also has one of the most sophisticated public transport systems in the world, and from this aspect, an intensified exchange with and transfer of knowledge from Japanese transport planners is certainly to be welcomed. Much as with the Dutch assistants to the municipality, proponents of a bicycle infrastructure for Managua should view the Japanese experts as important possible allies for their cause, and as influential experts who could potentially lend active technical and/or financial support to a bikeway project.

### **4.1.3 Political Aspects**

#### ***Political Support from Civil Society Actors***

Many prominent members of civil society, sociologists, engineers, environmentalists, architects, and youth educators are very supportive of the idea of building a bicycle infrastructure for Managua, saluting the incentive for both social and environmental reasons. This has much to do with the fact that the general acceptance of bicycles as a means of transportation is so much higher in Nicaragua than in other Latin American countries, mostly because they are already so extensively used in many other Nicaraguan cities.

In the spring of 1997, the Nicaraguan environmental organization FUNCOD organized a campaign called “Por el Futuro, Usemos Bicicletas” intended to promote the use of cycles in Managua. FUNCOD justified their campaign pointing to the problematic public transport situation in Managua, the significant increase in the number of cycles available in the country today, the necessity to look for alternative solutions to transport in general, and the savings in foreign exchange if the country were to import less fuel and other automobile resources. The main objectives of FUNCOD’s campaign were the following:

- to demonstrate the benefits of using bicycles as an alternative and environmentally-friendly mode of transportation,
- to identify possible corridors for cyclists in Managua and other departments
- to bring the existing use of bicycles and tricycles in Nicaragua to the attention of the MCT
- to eradicate little by little existing prejudices against cycles in Nicaragua
- to initiate a Promotion Program for Bicycles in conjunction with the National Transit Police, the City of Managua and the MCT
- the promotion of transit laws which specifies the rights and responsibilities of cyclists
- to educate cyclists and drivers about traffic laws and signs
- to stimulate the environmental consciousness of the general population with regard to non-polluting transport alternatives

FUNCOD also carried out a survey among cyclists in Managua, and organized a bike ride in March, which ended with speeches and presentations at the Malecon. Various government officials were present at this event.

#### ***Concrete Political Support from the City Government***

Probably the biggest obstacle to getting a bicycleway infrastructure constructed in the city of Managua is that neither the mayor himself or any other high-ranking city or federal politician has taken a personal interest in such a project. This is still essentially “how things get done” in Nicaragua today. Given the rather hierarchical structure of the city administrative system, it is of little value to have city planning engineers or even the Director of the City Planning Office convinced of the usefulness and necessity of such an infrastructure, because all initiatives for projects and planning initiatives come "from above." Lower-level officials are unlikely to pursue a project unless it has been presented to the mayor or one of his close advisors first, and subsequently passed inspection there. Nevertheless, planning experts and engineers in the City Planning office are quite open and sympathetic to the idea of a bikeway system.

#### **4.1.4 Economic and Fiscal Aspects**

While the initial construction of a complete bicycle network would obviously present a substantial expense for the city, the same infrastructure would actually save the city money in the long run, because the maintaining of such an infrastructure is much cheaper than the maintaining of a road network for motorized transport. Wear and tear on the streets from motorized vehicles, especially from heavy trucks, vans, and buses is a substantial "running cost" to society, and an expense which is often even incompletely accounted for in tax structures and revenue systems. The availability of a safe and convenient network for non-motorized transport is very likely to encourage a permanent increase in its overall modal share, decreasing the demand for motorized travel, especially for short and medium length trips of 2 to 10 km length.

Also, bicycles not only need much less road space when in use, but also for parking. Parking is presently almost entirely unregulated in Managua, meaning that there are no appropriate amenities, so that cars park anywhere in the public sphere, usually in the middle of sidewalks, incommodating pedestrians, or alongside the street, taking up scarce road space for free. In contrast, bicycle parking infrastructures can be provided at very low cost. Up to twelve bicycles can be parked on the same spot as an average size car.

Unlike many other municipalities in Nicaragua -- or the rest of the world, for that matter -- the city of Managua is not as notoriously cash-strapped as may be expected. This is largely due to the fact that a 2% income tax is imposed on all businesses in Managua, a revenue which goes directly to the city, whose only substantial infrastructure spending is for sanitation and transport infrastructure. The vast majority of all businesses in Nicaragua are located in Managua.

Regarding the future financial situation of the city of Managua, the picture may be less rosy, as other financial resources are faltering. Until recently, all municipalities in Nicaragua together were guaranteed 4.5% of the federal budget, but the new government reformed the Municipal Law, annulling this regulation completely. According to the Association of Nicaraguan Municipalities (AMUNIC), many local governments thus see themselves forced to lay off up to 50% of their staff because of the lack of economic resources. While this is unlikely to happen in the case of Managua, it nevertheless represents a serious change in the overall distribution of financial funds which threatens the autonomy of local governments. As this is an ongoing political struggle at the moment, it is too early to speculate on the implications for Managua's ability to finance a bike infrastructure.

## **4.2 THE HARD FACTORS: ENVIRONMENTAL AND PHYSICAL ASPECTS**

### **4.2.1 Climate**

Managua is hot and tropical, with frequent rainfalls all year between March and November. Heavy rainfalls may prevent people from riding bikes at select times of the year, but usually only for short periods of time. While extensive heat is generally not conducive to biking, it is certainly preferable to icy cold and freezing rain or even snow, and as a rule, Nicaragua's climate has not seemed to deter people in other cities from biking. Nicaragua's prime bike cities of Chinandega, Leon, and Rivas, for example, are even hotter than Managua.

### **4.2.2 Physical Layout of the Road Network**

Managua's physical layout is in many ways ideal for a bike infrastructure, because much of the terrain is relatively flat, at least along east-west lines. Consequently, the city's entire road network is largely oriented along east-west and to a lesser extent along north-south lines. There is some inclination from the Lake in the North upward towards the south, but even most of the strategic North-South climbs would be manageable for a cyclist of average strength even with a simple one-speed bike.

Given this overall layout of Managua, any integrated bikeway system would ideally be oriented along longer east-west and shorter north-south corridors. However, when planning the bike lanes, special attention should also be given to the faultlines which run right through the center of Managua. (see map "PMAC Zonificacion Ambiental on the next page).

As previously stated, the most serious deterrents to bicycling in Managua today are the complete absence of any protective infrastructure for cycling, and the dangerous conditions on roads due to crowded traffic and uncontrolled, aggressive driving behavior on the part of the drivers of the motorized vehicles, especially bus and taxi drivers. (Taxi drivers work twelve hour shifts.)

### **4.2.3 Pollution**

The most heavily traffic corridors, alongside which protective cycling infrastructures in the form of cycleways are most urgently needed, are naturally also the most polluted corridors, with sub-standard public transport vehicles being responsible for the majority of the exhaust fumes. The situation would be somewhat better if the cyclists could ride on bikeways which were physically separated through bushes or trees from the streets, but as this will not always be possible, it is important to consider improving other aspects of the transport sector as well, especially with respect to the emission control standards for public and private motorized vehicles.

- insert map zonificacion ambiental -

## **5. BICYCLE INFRASTRUCTURE PLANNING FOR MANAGUA- THE BASIC PROGRAM REQUIREMENTS**

By giving examples from both the public and the private sectors, chapter three made a good case for an increased use of non-motorized transport in Managua, looking at economic, environmental and health aspects. The previous chapter then put the vision in the proper context, analyzing constraining and enabling factors for cycle use in the city. However, little has been said so far about the specific requirements for the implementation of a cycle infrastructure. The purpose of the following chapter is to provide some methodological guidance and to give an overview of the basic program requirements of an urban cycle network.. Illustrations will serve to develop a better visual picture of existing options.

First of all, it is important to realize that the planning process for such an infrastructure always needs to be imbedded into the broader project of developing a sustainable transport policy strategy. In other words, the real challenge is to convince decision-makers to look at biking in terms of policy making, and to give the issue of non-motorized transport promotion structural and permanent attention within the transport planning sector (Pettinga 1989). The overall program requirement is therefore twofold, consisting of the development of a cycle policy, and the development a cycle network plan.

### **5.1 DEVELOPING A CYCLE POLICY**

In any given environment, cycles will only ever be one of several transport options, and while they may be very well suited for a variety of trips, especially in urban environments, they may be inappropriate for others. An obvious starting point for the development of a cycle policy is therefore a detailed analysis of the potential uses of cycles. Increased cycle trips may help to reduce excessive walking in areas not properly served by public transport, such as peripheral informal settlements, or overcrowding of public transport vehicles along frequented routes. Cycles are especially competitive over shorter distances up to 5 km. By analyzing trip patterns, lengths and destinations, planners can develop a preliminary picture of where major links in the network should be routed. Research should not be directed at people who already use the bicycle as a means of transport. Their origins and destination patterns are not nearly as important as those of the potential users of a new system. The number of present bicyclists is, therefore, irrelevant as the new infrastructure, which is seeking to give new physical space to the potential “hidden” cyclists (Pettinga, 1989). Any structural analyses should be supported by a package of general policy measures, which take into account local conditions. Section 6.1 of this report will lay out various policy measures for the City of Managua.

Unfortunately, Managua is not an easy city to analyze when it come to travel patterns, as there is no clearly defined, dense city center towards which most working people are heading in the morning, so that there is no typical center to periphery commuting pattern. In addition to this, one has to remember that only about 30% of the people in Nicaragua are actually employed. There are, however, several identifiable main trip destinations within the city, the most prominent of them being the major markets/bus terminals, i.e. the mercados Huembes (Central), Oriental, Boer, and Ivan Montenegro, which all attract large numbers of vendors, informal traders and buyers every day. Other important destinations are the universities, such as UCA, UNI, UNAN, UNA, and

several locations in the old, destroyed center. See the map “Flujo de Rutas” of PGDU and “Actividades en el Centro” of PMAC at the end of this chapter for an illustration of the major traffic flows to these main destinations.

## 5.2 DEVELOPING A CYCLE NETWORK

A cycle network always consists of a package of measures, and the network can consist of various portions of cycle routes, cycle lanes and separate cycle tracks. Cycle routes are indicated by signalization only, the street network itself is not amended. Cycle lanes form part of the existing road network, but the cyclists are separated from motorized traffic. This can be done through as little as a painted line on the road surface, or through a more efficient, ongoing raised curb. Separate cycle tracks are separate infrastructures in their own right, with no direct connection to the road for motorized traffic. See illustration II, figures 2 and 3 at the end of this section for further explanation. Various other options, such as shared bus and cycle lanes may be appropriate, depending on local conditions.

Certain limiting factors always apply, however, regardless of the use and function of the design of the network. These factors refer mostly to:

(i) The space needed by cyclists to safely maneuver in traffic (see illustration I, figure 1 at the end of this section). The necessary space increases if side-by-side riding and safe passing is to be possible.

(ii) The limited ability to overcome resistance on human-powered vehicles. This is affected by the physical conditions of the vehicle (friction in bearings and chain, availability of brakes and gears, vibrations in the frame), of the rider (muscle strength and endurance), and of the environment (uneven road surfaces, obstacles, inclination, wind, heavy rain).

(iii) The limited amount of mental stress which can be endured by cyclists for safe riding. Cyclists would be most comfortable riding at a consistent speed of 15-20 km/h on an empty, separate track, but this is of course rarely the case in urban traffic, where they often have to weave through lanes of motorized vehicles, balancing the cycle through slow moving, stop-and-go traffic. There is an obvious relationship between comfort and traffic safety, as busier, more stressful and attention-demanding routes are more likely to produce accidents. (Also see CROW 1994).

Dutch cycle network planners have developed a useful set of five main program requirements which cover all requirements and wishes of a potential cyclist. These are:

**(1) Coherence:** The cycling infrastructure must form a coherent unit and links with all departure points and destinations of cyclists. All factors related to the necessity of arriving at a destination are related to this requirement. Cyclists must be able to understand the logic of the network to arrive at their final destination.

- (2) Directness:** The cycling infrastructure continually offers the cyclists as direct a route as possible so that detours are kept to a minimum. All factors influencing journey length and time are related to this requirement, with its main criteria being speed of flow, delays and detour distance. On an urban level, a maximum width of 400 to 600 m between parallel lines of the network is suggested to avoid large detours.
- (3) Attractiveness** The cycling infrastructure is designed and fitted in the surroundings in a way that cycling is attractive. Cyclists make individual choices based on personal preferences, with an important criterion being the sense of social safety of a route. Other important psychological factors related to this requirement are overall visibility, and the experience of the surroundings. Another, often overlooked factor is the availability of storage facilities.
- (4) Safety** The cycling infrastructure guarantees the road safety of cyclists and other road users. Only factors influencing objective and subjective road safety are related to this requirement -- not the ones related to social safety, which are included in (3). The best criterion for the evaluation of existing facilities is the incidence of traffic accidents.
- (5) Comfort** The cycling infrastructure enables a quick and comfortable flow of bicycle traffic. All factors related to obstructions and delays caused by bottlenecks and other shortcomings in the infrastructure are included under this requirement..

*(The above is adapted from: CROW Record 10 "Sign up For The Bike" )*

### **5.2.1 The Search for Missing Links in Managua's Existing Cycle Network**

An appropriate cycle network for any given city cannot be developed without an analysis of the overall urban structure, and the already existing infrastructure. The essential task is the search for the main missing links in a network. Managua presents a unique challenge in that respect, because most major streets are unfit for riding at the present.

Managua's existing transport infrastructure is essentially dividable into a larger network of collector streets, many of which almost function as urban expressways, and which are quite dangerous for non-motorized transport users, and many smaller networks of residential streets, where traffic flows are low enough that no special cyclelanes would be necessary on the roads. The fact that most of the major traffic connections in Managua are unsuitable for bike riding at the moment is problematic, because in essence, this means that they all represent missing links in the existing cycle network, as well as obstacles for smaller, rideable neighborhood streets which continue across these collectors. Fortunately, a good number of these major links are wide enough to allow for the installation of bicycle infrastructures, either onto the road surface, or alongside it. Section 6.2 of this report will give various concrete examples for possible network developments and pilot projects.

- insert "flujo de rutas" map -

- insert "actividades en el centro" map -

- *insert illustration I* -

- *insert illustration II* -

## **6. BUILDING TOWARDS THE SOLUTION - SPECIFIC PLANNING RECOMMENDATIONS**

Given that none of the constraining factors in the previous chapter actually preclude the planning and building of a cycle infrastructure for the City of Managua, the following chapter will take the quest for adequate cycling options in Managua one step further and give specific recommendations for the implementation of such an infrastructure. In keeping with the twofold structure of the previous chapter, this chapter will also first comment on various “soft” planning options relating to social, political, and administrative measures, before moving on to “hard” planning options and a presentation of possible network scenarios and pilot projects.

### **6.1 "SOFT" PLANNING ASPECTS: EDUCATION, TRAFFIC REGULATION, ADMINISTRATIVE INITIATIVES, AND SPECIAL ACTIVITIES**

#### **6.1.1 Traffic Education**

As mentioned in chapter five, the Transit Police is already making efforts to improve traffic education in Managua. A plan for building a traffic education park with adjacent educational facilities is already underway. A program with specific reference to cycling should be developed, modeled on the already existing initiative in Leon. The environmental NGO FUNCOD already developed a “cyclists handbook” which teaches appropriate cycling behavior, basic hand signals and provides recommendations for safe riding in various cycling environments. This could be printed and distributed through the police, and a seminar in traffic education should become mandatory for all schoolchildren, as well as a stricter exam for prospective driver’s license holders.

#### **6.1.2 Traffic Regulation and Legal Aspects**

The existing street network of Managua needs to be better hierarchized and regulated. Many dirt roads in residential areas should be closed for motorized through traffic altogether, others could be open for public transport vehicles only. Additional traffic signals should be established at various points in the city, especially at major intersections, to allow for the safe crossing of slower moving traffic such as pedestrians and non-motorized traffic.

The main problem with developing a stricter and more stringent traffic regulation in Managua is the question of enforcement. Many people simply do not respect traffic signals because there is no danger of punishment. The transit police would have to start giving more tickets to drivers who disrespect traffic laws and signals. Current fines are not excessively high, but they are probably adequate given Nicaraguan income levels, and the system is already actually quite efficient in one respect: convicted drivers are required to hand over their drivers licenses in return for the traffic ticket, which allows them to continue driving home. They are then required to first pay the ticket at one location, turn in the stamped, paid ticket at another locations, and subsequently pick up their license again. The hassle is feared more than the expense. A bigger problem is related to insurance against accidents, which is virtually non-existent in Nicaragua. Especially bus and taxi drivers, who do not earn much money, are usually not insured, so if they hit a bicyclists, there is little chance of adequate damages being paid by anyone. Laws need to be changed so that the disobedience of traffic regulations and subsequent damages do not go unprocecuted.

### **6.1.3 Administrative Aspects and Special Incentives**

Setting specific targets can be very useful. When Lima, Peru decided to actively promote bicycle use a few years ago, an official municipal decree was passed in which the municipality committed itself to increasing bicycle use from 2% to 10% of all trips. A similar target could be issued for Managua. Institutionally, the setup of either a municipal program for non-motorized transport, or at least the formation of a non-motorized transport advisory group made up of members of the city government, the transit police, the Ministry for Construction and Transport, the Environment Ministry, environmental and transport advocacy NGOs and other qualified civil society experts which reported directly to the mayor would help with the administrative aspects of developing a cycle policy. Pro-cycle outreach efforts such as brochures, posters, and public events should also be part of the new policy. Funding for these kinds of efforts in developing countries has frequently come from cycle-friendly developed countries such as Holland, Denmark, and Germany.

Another valuable measure, which has already been initiated by the transit police in Managua, is a program of public traffic safety education, not only to cyclists, but especially to all youth, and colectivo and taxi cooperative employees. Requirements for obtaining a drivers license should also be toughened, making sure that all participants in the transport infrastructure know traffic rules and signs, and have a minimum amount of respect for each other. In Leon, the German partner city of Hamburg funded a traffic education park for exactly this purpose, and thousands of schoolchildren and hundreds of drivers have since passed through the site, already significantly reducing the amount of youth getting killed on their bikes by motor vehicles.

## **6.2 "HARD" PLANNING ASPECTS: NETWORK SCENARIOS AND PILOT PROJECTS**

This section looks at various possible routing options for a bicycle network in Managua. Depending on the overall policy and target groups, different possibilities will be considered. A very valuable inspiration for the following specific recommendations was provided by a thesis completed at the Universidad Nacional de Ingenieria (UNI) in the fall of 1993, entitled "Desarrollo del Sistema Ciclistica en la Ciudad de Managua." The final part of the work includes suggestions for the localization of several cycling corridors in the city of Managua. Although the UNI thesis proposes somewhat alternate routes along the corridors along the Pistas Solidaridad and Resistencia, it is largely congruent with the proposal of this present study with regard to the basic layout of the cycle network., and a copy of the UNI thesis' detailed routing proposals is included as an annex to this study (in Spanish only).

The section is organized into four parts. The first part is laying out the "bare bones" for a comprehensive cycling network, identifying seven main corridors in the city (Compare map "Red Principal"). The second part then lays out an example for a comprehensive network (compare map "Ejemplo de Una Red Completa"). Two other short parts are focusing on particular aspects of the basic network. (compare map "Proyectos Pilotos Especiales").

### **6.2.1 The Main Corridors of the Network**

As mentioned in previous chapters, the principal deterrent for cycling in Managua comes from the fear of riding in dangerous traffic along Managua's major traffic corridors. Unfortunately, for many of these major corridors, there are few or no alternative routes for cyclists to take which would fulfill the basic program requirements of coherence, directness, attractiveness, safety and comfort. As a consequence, new cycling infrastructure, in the form of bikelanes or parallel bikeways, needs to be provided. The main proposed north-south connections are Avenida Bolivar/Avenida UNAN; the Carretera a Masaya, and a short connection through the Barrio Martha Quezada. The main proposed east-west connections are the Pista Suburbana/Pista de la Solidaridad, linking up in the north-west with the Carretera Norte; the Pista de la Resistencia, linking up north with the Carretera Norte a little more towards the east; the Dupla Sur in the center; the Carretera Norte with an extension in the center, and finally a recreational path along the lakefront. Refer to the map entitled "Red Principal" for an overview of the main routes described below. The pictures on the following pages further illustrate the physical layout of the various corridors. Any one of the corridors would provide an excellent pilot project.

### ***Via Recreativa along the Malecon***

As for the proposed route along the Malecon, a pedestrian path is already being planned as a car-free recreational route along the lakefront, but no special mention is being made for cycles. An important supporting measure for increased recreational use also mentioned in the UNI study would be to close off the North end of the Avenida Bolivar and the streets adjacent to the Malecon promenade to motorized traffic on weekends.

### ***Corridor Avenida Bolivar / Avenida UNAN***

Avenida Bolivar, whose southern extension is the Avenida UNAN, is wide enough to include cycle lanes, or even separate cycle tracks, and they were actually included in the original plans for Bolivar's recent reconstruction, but the money allocated for the cycleways mysteriously disappeared before the execution of the project. Nevertheless, there is not reason why this could not be fixed retroactively, and relatively spacious, concrete sidewalks already exist along part of the way, presently with little pedestrian traffic.

### ***Corridor Avenida de las Naciones Unidas / Carretera a Masaya***

The corridor Avenida de las Naciones Unidas / Carretera a Masaya is another crucial north-south corridor, where room theoretically exists for building a cycling infrastructure. Starting just south of the Laguna de Tiscapa, an infrastructure could be built along the sidestrip, or on the Western side even atop the small *cauce* which runs parallel to the street there.

### ***Corridor Pista Sub-Urbana / Pista de la Solidaridad***

From its western entrance onwards, the corridor Pista Sub-Urbana/Solidaridad has a wide median strip which provides enough room for a bi-directional cyclepath. As the corridor approaches Centroamerica, the use of the middle strip becomes more problematic, and between Centroamerica and Lozelsa streetspace becomes extremely scarce. Cyclists would have to convert to sharing roadspace with motorized traffic. Traffic continues to be rather crowded and dangerous up to the Rubenia traffic lights. (See picture of the cyclist walking his bike alongside the curb near Centroamerica.) The UNI study proposes leaving the Pista de la Solidaridad altogether, and taking alternate routes through Centroamerica, Altamira and Nicarao up to Rubenia. It is questionable, however, that cyclists would actually be willing to make these detours, which are much less direct. An alternative would be to convert the outer of the two lanes in each direction into a shared bus/cycle lane, leaving only the two central lanes for private motorvehicle traffic. The median or side strips could potentially be converted to exclusive cycle use as early as east of Lozelsa. After Rubenia, there is also enough room to construct cicleways up to the intersection with the Pista Pedro Joaquin Chamorro.

### ***Corridor Carretera Norte / Pista Pedro Joaquin Chamorro***

For part of the corridor Pista Joaquin Chamorro / Carretera Norte, there exists a parallel road to the main street, which could be converted to exclusive bus/cycle use. Along stretches, enough room exists on the main street to mark off cyclelanes, but a more detailed analysis of crossing points would be necessary.

### ***Other Corridors in the Center***

Approaching the center, there would be two bikeroute extensions of the carretera Norte corridor, one heading slightly north, coming out at the east end of the Plaza de la Revolucion and heading up to the recreational path at the Malecon, and another route heading slightly south, and then going east along the Dupla Sur. Another route would run along the northern end of the barrio Martha Quezada as well as north-south though Martha Quezada and Bolonia until the Pista Benjamin Zeledon. The streets near the center form a more consistent grid, however, and it is more convenient for cyclists to switch from the major thoroughfares to the parallel residential streets without having to make great detours.

*insert map red principal*

*insert pictures malecon/via recreativa*

*insert pictures Ave bolivar/Unan*

*insert pictures carretera a masaya*

*insert pictures pista suburbana/solidaridad*

*insertpictures solidaridad*

*insert pictures pista de la resistencia*

*insert pictures carretera norte*

## 6.2.2 The Comprehensive Urban Commuter Network Alternative

The above described corridors would provide the basic skeleton for a cycle network in Managua, but in order to make the network comprehensive, several other secondary and tertiary connections would have to be established and/or marked. The map “Ejemplo de una Red Completa” at the end of this section provides an overview of the main connections necessary in order to provide convenient access to all important points in the city. As a general rule, it would be preferable to route cyclists along less trafficked, residential streets which run parallel to major traffic arteries. More residential alternatives to the secondary routes are marked on the map in yellow. In the low-traffic residential areas, the bike routes would simply be marked by signs, and cyclists could share existing road infrastructure. No new cycle lanes would have to be built. However, replacing the suggested secondary connections with residential street alternatives is not always possible, or sometimes inconvenient.

It should also be noted again here that a clear hierarchization of the road system in Managua is non-existent, and several streets with residential appearance and design show very high traffic volumes, while other roads which look like major thoroughfares actually have lower traffic volumes. A more comprehensive routing study for the secondary and tertiary missing links is therefore still necessary.

The included map is thus simply a suggestion, not a closely researched route. It reflects an attempt to provide both continuous and direct east-west and north-east connections, so that even cyclists who only traverse certain sections of the city and take trips of maybe 3 to 5 km length do not have to make large detours. The density of the suggested cycle network is 300 to 1000 meters between marked links (any street or path suitable for cyclists is considered a network link). The assumption is that there are almost always low-traffic residential routes available to take as alternatives between the wider gaps in the specially marked network. So the *de facto* width of the network would be below 300 to a maximum of 600 meters, i.e every 300 to 600 meters, cyclists would be able to find a rideable route of some form or another. Therefore, a missing or temporarily closed network link would cause cyclists to make a detour of 1.2 km at the very most. For an average journey of about 3 km length, this would be about 40% extra travel time. As an occasional detour, which would only apply to part of the users at certain times anyway, this is still justifiable. Some examples of the existing missing links where detours of over 500 meters between populated areas occur are marked in the map in red.

## 6.2.3 The Student Network Alternative

This alternative is essentially a smaller version of the complete commuter alternative, which concentrates on first establishing a network of cycle corridors for students, both in primary and secondary education. Given their youth and their low- to non-existent income, students are especially likely to take advantage of a new cycle infrastructure. This alternative would therefore focus on providing safe cycle access to all major Universities and schools in Managua. A particularly convenient University pilot project would be the stretch between Avenida de UNAN and the Pista de la Resistencia which connects the UNI/UCA and UNAN universities, and which is also designated as part of the main backbone of the cycle network (see map “Proyectos Pilotos

Especiales” at the end of this section). Measures such as safe bike parking and maybe special credit schemes for families with students so that they could acquire bicycles could complement the project.

As for cycle access to primary education, students typically live within a few kilometers of their school, so the main task would be involve working out low-traffic residential routes to schools within the barrios, so that students who live nearby could safely get to these institutions. Quarter-specific studies may have to be conducted here, particularly looking at intersections and other crossings. (For more information on the potential economic benefits of cycle use for families with students, refer to Chapter Three of this study.)

#### **6.2.4 The Recreational Network Alternative**

This network alternative would focus not so much on providing access to major points within the city, but rather provide quick escapes to more scenic cycle routes outside the city. It would be a network intended primarily for weekends, not for commuting, but for recreation, intended to make people aware of the potential of the bicycle for recreational use. It could also serve as a new tourist attraction, one of Managua’s few. The main element of this network would be an extension of the proposed new recreational path along the Malecon, hopefully combined with a partial closure of the northern section of the Avenida Bolivar to motorized traffic. Other attractive possibilities are the construction of a cycle path along the right-of-way of the abandoned railway line, possibly going on for miles and miles out of the city, or out towards the popular recreational area of Xiloa. (Also see map “Proyectos Pilotos Especiales.”)

*insert map Ejemplo de red completa*

*insert map proyectos pilotos especiales*

## **7. CONCLUDING REMARKS AND NEXT STEPS**

Building a network of cycle paths in the city of Managua makes a lot of sense. Under present conditions, cycling is not recommended in the city, but with the existence of a proper infrastructure which assured that cyclists could safely and conveniently access all major destinations of the city, cycles could potentially be a significant portion of the transport modal share. Implementing a cycle infrastructure in the city of Managua would benefit both the people of Managua and the environment. In the long term, it would also have a beneficial impact on the City's finances, as the provision and maintenance of a cycling infrastructure is much cheaper than comparable infrastructure for motorized transport.

A major hope for this study is that it may inspire the City of Managua to seriously commit itself to the development of a sustainable transport infrastructure and to take an active interest in the promotion of non-motorized transport. Many other players could help contribute towards this worthwhile cause. If indeed committed to the cause, national and municipal government officials should approach multilateral development banks and/or bilateral aid organizations from developed countries as potential funders for a more comprehensive routing and engineering study for a cycling network. Given the increased attention cycle infrastructure planning is receiving in many of these countries as a way of making urban transport systems more sustainable, some developed country governments are likely to be interested, especially Holland, Denmark, Switzerland, Germany, and Japan, all of whom have technical assistance programs in Nicaragua.

Securing funding for such an engineering study would be a first major step towards the actual realization of the vision outlined in this study. Other major steps would be the actual planning and execution of a pilot cycleway, and the creation of a Department for Non-Motorized Transport within the Alcaldia of Managua. If this report had any influence on the execution any of these projects, it would have served its purpose. This feasibility study was not intended to be a finished project. Rather, it is as a starting point for discussion.

The city of Managua is at a crucial stage of its (re-)development, and major infrastructure decisions with important environmental, economic and social ramifications will be made over the next decade. A decision to include the provision of a non-motorized infrastructure into the city's development plans for the next millennium would put the Nicaraguan capital of Managua well ahead of other developing country metropolises in terms of environmentally and socially sustainable, visionary urban planning.

Modernization does not mean motorization.

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