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The World Bank's Portfolio of Urban Transportation Projects in Latin America: How Does the Bank Consider Climate Change?

Portfolio Review

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1. Introduction

This paper presents the findings from the portfolio review and interviews with World Bank staff and consultants. It is a companion paper to the June 2009 UC report to the World Bank on methods and approaches for transport project CO2 evaluation. (Schipper, et al., 2009)

In the June 2009 report, we showed that light-duty vehicles in metropolitan areas generate most of Latin America's transportation emissions, and reducing these emissions requires more than substituting clean vehicles for dirty ones. Technology changes are effective, but they will be more than offset by the expected growth in car use in Latin America. Technology forecasts currently suggest that new fuels and vehicles could reduce emissions per km by 30% by 2030. But car use is expected to grow by 300 percent during the same period, unless additional steps are taken to moderate this increase. (Schipper, et al., 2009)

In this context, sustainable transportation and urban development are important strategies for reducing CO2 emissions from transport. By investing in high quality public transit and new facilities for bikes and pedestrians, Latin American cities offer travel choices that improve accessibility for a large portion of the population while managing traffic, cutting pollution, and moderating CO2 emissions. In specific corridors, these investments can reduce carbon emissions from the forecasted emissions without the interventions. (See the case of Mexico City: Schipper, et al., 2009; Rogers, 2006)

In this report we discuss how the urban transportation practice of the World Bank addresses climate change issues in Latin American cities. We reviewed the urban transportation projects the World Bank has financed in Latin America, and considered the processes for their selection, design, and development. We wanted to learn—concretely—what kinds of infrastructure, plans, policies, processes, and equipment World Bank-financed projects use to respond to climate change. We studied only the World Bank's urban transportation practice in Latin America, including energy, environment, and urban services projects that had implications for metropolitan transportation and development. We did not consider rural roads projects, although we do include roads projects that affect existing metropolitan areas, and areas that one could reasonably expect to urbanize in the next 30 years. Moreover, we did not seek to evaluate any particular group of projects or estimate their potential greenhouse gas emissions savings. Instead, we wanted to know how World Bank-financed projects integrate the issues of land use, non-motorized transportation, and automobile use into projects, and whether the projects seeking to reduce carbon emissions address these areas in unique ways. Our goal was to identify possible synergies or contradictions across projects that sometimes operate in different realms of the urban environment, from streetscapes to road investments, from land use planning to bus operations. We used three methods to investigate these questions: an analysis of the publicly-available project documents for all contemporary urban transportation projects in Latin America; an analysis of the environmental and economic reviews of the projects to identify whether carbon emissions were included in the analyses and where they could be included; and interviews with World Bank staff, consultants, and partners to learn how they consider climate change issues in the selection, design, preparation, and administration of projects.

In the next section we discuss the data and methods used in this research. Section three presents findings from our analysis of the World Bank's portfolio of urban transportation projects in Latin America, and section four follows with insights from practitioners whom we interviewed. Section five discusses the potential for introducing carbon calculations into existing project economic and environmental reviews. In section six we summarize and discuss our findings

and suggest how practitioners and organizations could advance work on climate change by including it in their project design and development processes.

2. Data and Methods

We used three methods to investigate our research questions about the urban transportation interventions the World Bank supports and its process for developing these projects. First, we conducted a review and analysis of the World Bank's urban transportation projects using the World Bank's database of projects. We then reviewed the cost benefit and environmental analyses presented in project preparation documents. Finally, we carried out a series of semi-structured interviews with World Bank staff, former staff, and consultants to discuss the projects and learn about the World Bank's role in shaping them.

A. Review of the World Bank's Portfolio of Projects

Our analysis of World Bank projects used data mainly from two sources: the World Bank's operations database and loan preparation documents.

First, we identified the universe of recent transportation and transportation-related projects in Latin America using the World Bank's project database.¹ We selected projects from this database using two criteria: they had approval dates no earlier than January 1, 2000, and at least one of the projects' sectoral classifications included transportation.² These criteria produced a collection of projects that included all projects with some transportation components regardless of whether they are urban or rural, or whether the directors in the energy, environment, water, or urban departments of the World Bank administer them. This search returned 261 projects mainly from the transportation sector, but also included projects from sectors such as public sector governance (36), urban development (34), economic policy (16), water (7), and poverty reduction (2), among others.

We refined this set of projects by identifying those that were relevant to metropolitan development and urban transportation issues. To make this determination we reviewed loan preparation and other documents for each project to understand its focus and scope. Urban mass transit projects, transportation reform, urban services and housing projects, and some urban water projects had obvious urban transportation elements. Other projects required more investigation. For each project without an explicit urban focus we checked to see if it had metropolitan policy or infrastructure within its scope. In other words, a state roads program or a rural poverty project that included an "urban boulevard" or urban "bypass" we considered relevant to metropolitan transport. Projects that focused on institutional strengthening around road network planning we also considered relevant because of their potential influence on long-run urban development. We did not include projects that were narrowly focused on rural poverty, paving, rehabilitation, asset management, and financial management without a spatial or network planning element.

¹ Link to the project database: [Projects and Operations](#) data. The projects and operations database is publicly available, but the public version does not include all of the projects that are accessible internally. Our search used the internal database, but all of the projects that we include in the analysis have publicly available documents.

² Projects can have up to five sector classifications, including water, urban services, transportation, etc.

Of the original 261 projects, 118 projects did not have documentation that we could access through either the internal or external project database.³ Two projects had documents, but the documents did not provide enough data to determine whether the project was urban or not. Of the remaining 141 projects, we eliminated 69 because they were not related to metropolitan development or urban transportation. Of the 72 remaining projects, nine were studies commissioned by the World Bank on topics that can be relevant to metropolitan transportation and climate change issues such as competition in the transport sector, infrastructure and economic development, and infrastructure regulation. One of these studies was an urban transportation policy strategy for Panama. Unfortunately, the studies' documentation did not include information about their development and costs, so these data are treated separately from the portfolio review analysis, although we do use them to inform the discussion of technical assistance. Sixteen of the projects were tagged as being "dropped" (not "active", "closed", or in the "pipeline"), and because dropped projects may be combined with other existing projects we excluded all of them. Six more of the projects were excluded because the project documents did not have enough information to describe the loan amounts, or to confirm that loans were made.

Ultimately, we confirmed that 41 projects were relevant to metropolitan development and urban transportation in focus and/or scope and had enough reported data for us to analyze them. Of these 41 projects, the transportation sector board administered most of them (26), and others were administered by urban development (7), environment (5), and water (3). For each of these 41 projects in our sample we collected data from project preparation documents on "project components" (what the loan is used for), projects costs, and loan amounts. In general we used all of the available documents to collect and cross-check information, but the most consistent source of information came from Project Appraisal Documents, which are created mid-way through the project development cycle and may not always reflect the most up-to-date information. This is a limitation of this method, and we have tried to include the most recent, reliable information wherever possible.

We categorized the 41 urban transportation projects in our data set in two ways: with a characterization of the type of project and with characterizations of each component. The first category – "project type" – describes each project's major emphasis. We constructed this variable based on our reading of the project documents. Table 1 describes each of the category's values and the logic by which we assigned projects to them. The second category – "component" – describes the elements or activities that comprise each component of a project as defined by the World Bank. In nearly all cases, a project component is a heterogeneous mix of activities, which is why "component" in our data set is a constructed variable.⁴ We included all of the components for the 41 projects in our data set. The components in our data set, and the logic behind their assignment, are detailed in Table 2. Each project can include a mix of components. For example, a climate change project may include transit infrastructure, water infrastructure, municipal improvements, technical assistance, and institutional strengthening.

³ Forty-four (37%) of the 118 projects without documents were "dropped", and would have been excluded from the analysis. Economic and sector work, Technical Assistance (Non-lending), and loans in the "pipeline" comprise 91% of the remaining 74 projects. Only three "active" and "closed" loans were excluded because of lack of documentation. These were a roads project in Brazil, a natural disaster mitigation project in Honduras, and a structural adjustment loan in Honduras. Nevertheless, the high proportion of economic and sector work and technical assistance excluded because of lack of documentation is unfortunate because of the significant role these activities play in the World Bank's strategy.

⁴ A table describing the detailed elements of components is included in this report as an appendix.

Table 1. Types of Projects in the Portfolio of World Bank Urban Transportation Projects, 2000-2008

Project type	Description
Climate change	Receives Global Environmental Facility grants (or other grants tied to climate change issues) and discusses climate change and carbon emissions explicitly in the documentation.
Development policy	Funded with Development Policy Loans, which focus on government and institutional reform and do not include funding for infrastructure or public works.
Mass transit	Focuses on mass public transit infrastructure, policy, operations, and improvement.
Mixed infrastructure	Focuses on public works and combines water, roads, rail, and other infrastructure and physical improvements.
Municipal improvements	Focuses on the social and physical infrastructure of urban renewal, slum upgrading, services delivery (e.g. water, transportation), housing improvements, and land regularization in urban areas.
Road infrastructure	Focuses on road construction, maintenance, rehabilitation, policy, and management.
Water infrastructure	Focuses on drainage, flood control, and associated infrastructure and policy.

Table 2. Components in the Portfolio of World Bank Urban Transportation Projects, 2000-2008

Component	Description
Community development & participation	Stakeholder participation in a planning or policy-making process. May also include funding for the process.
Economic development	Economic development planning, works, and technical assistance.
Fleet improvements	Vehicle acquisition, replacement, and scrapping.
Freight rail infrastructure	Freight rail infrastructure and freight operations improvements.
Institutional strengthening	Activities that change or enhance planning or policy-making processes, markets, laws, government operations, and other institutions. Funding that supports ongoing monitoring and technology support for legal or institutional reform. May include technical assistance or physical infrastructure (e.g., a new government building).
Mixed infrastructure	Physical infrastructure for water, transport, social services, historic preservation. May include funding for technical assistance, monitoring, evaluation, auditing, and supervision.
Non-motorized transport	Physical infrastructure, education, promotion, policy, and planning for non-motorized transport. May include funding for technical assistance, monitoring, evaluation, auditing, and supervision.
Project management	Technical assistance, monitoring, evaluation, auditing, and supervision. May include consulting fees and the direct funding of operations.
Public campaign	Public campaign to promote and/or educate the public about an issue.
Rail infrastructure	Rail infrastructure, institutional strengthening for rail. May include funding for technical assistance, monitoring, evaluation, auditing, and supervision.
Roads	Road construction, maintenance, paving, design, planning, policy, management, and safety. May include funding for technical assistance, monitoring, evaluation, auditing, and supervision.
Social service provision & facilities	Design, construction, operation, management, and planning for community services and facilities.
Technical assistance	Studies and technical support for project components, especially the design, planning, and engineering of physical infrastructure or the design and planning of institutions and policies. May include funding for policy work and planning that would overlap with institutional strengthening, but emphasizes the technical support.
Transit infrastructure	Policy, planning, design, engineering of transit infrastructure, including roads, rail, buses, mass transit systems operation, non-motorized transport infrastructure. May include funding for technical assistance, monitoring, evaluation, auditing, and supervision.
Travel demand management	Studies and policy and planning work to manage automobile use.
Water infrastructure	Water infrastructure for drainage, sewerage, and sanitation. May include funding for technical assistance, monitoring, evaluation, auditing, and supervision.

B. Reviewing Projects' Cost Benefit and Environmental Analyses

In addition to reviewing project preparation documents for data about components and financing, we also reviewed the cost benefit and environmental analyses that these documents summarize. These project reviews are key areas in which climate change considerations could

be included, such as an estimation of a project's carbon emissions savings or generation. The publicly available Project Appraisal Documents provided only summaries of the full analyses, but in most cases these were sufficient for understanding the topics covered and the data and methods used, which were the main focus of this part of our analysis.

C. Interviews with World Bank Staff, Former Staff, and Consultants

We conducted 21 interviews with 22 people: 19 with members of the World Bank staff, two with consultants to the World Bank, and one with a Latin American transportation planner who has experience working on World Bank-financed urban transportation projects. The interviewees were selected based on their experience as task managers or other significant involvement with urban transportation projects, their availability, and their interest in participating. The interviews with Washington D.C. staff were conducted in person. Interviews with staff who were working in World Bank field offices outside of Washington D.C. were conducted by telephone or by videoconference. Most of the interviewees worked in the World Bank's transportation sector, but a handful worked in urban development or environment sectors. Also, most worked in operations, but a few worked in policy development.

While all but one of the interviews were with only one interviewee at a time, World Bank staff overseeing the project accompanied the researchers to most of the interviews, and we do not know whether and how their presence prevented (or encouraged) interviewees to speak freely. The interviews were conducted by the research team, but the World Bank staff sometimes asked additional questions that related to the research effort.

We structured the interviews to cover three topics: the role or significance of climate change in the interviewees' work, their experience integrating climate change considerations into projects, and their experience working with financial instruments relating to climate change. Otherwise we aimed to have free-flowing conversations. In all but five interviews one researcher guided the interview while the other researcher typed a record of the conversation, capturing as much of the actual language as possible. The interview notes were cleaned within one day of the interview.

3. Analysis of the World Bank's Urban Transportation Portfolio

We present a summary of the urban transportation projects by country in Table 3. The richer, more urban countries have more urban transportation projects and more lending/project costs. Of the 41 projects we reviewed, 10 were in Argentina, six in Colombia, five each in Brazil and Mexico, and four in Chile. Three-quarters of the projects are in these five countries, and they account for roughly 90% of the total project costs and lending.

Tables 4 and 5 present different, and complementary, summaries of the urban transportation portfolio's composition. Table 4 describes the different types of projects in the portfolio, and Table 5 describes the different project components in the portfolio. For example, the portfolio includes climate change projects, mass projects, mixed infrastructure, and municipal services projects (among others), and each of these projects may include investments in mass transit components, even when the main project has a different emphasis; Table 5 focuses on the total amounts invested in these different components.

Overall, World Bank loans paid for about 44 percent of total costs of all urban transportation projects., Global Environmental Facilities (GEF) grants handled by the Bank accounted for only

half a percent of total costs. Carbon finance funds (where a project sells its carbon emissions savings for a price on the carbon market) were a miniscule 3/100ths of a percent of total project costs. (See Table 4)

Most of the urban portfolio supports road and transit infrastructure. Mass transit projects captured 46 percent of total expenditures and metropolitan roads projects another 32 percent. The pattern is the same when we look at the components in the portfolio: transit infrastructure components accounted for 47 percent of total expenditures and road infrastructure components accounted for 35 percent of the portfolio.

Another nine percent of expenditures were for municipal improvements projects and eight percent for projects involving a mix of infrastructure. These projects included a wide variety of components including road and transit infrastructure, community and economic development, land regularization, and municipal services improvements.

Only 1.3 percent of project expenditures were toward climate change projects. GEF grants provided the main support for climate change projects. About 80 percent of the GEF grants in the urban transportation portfolio supported climate change projects; the other 20 percent supported mass transit projects. World Bank loans were not associated with climate change projects explicitly.

But there are similarities between climate change projects and other types of projects, particularly mass transit projects. For example, the carbon finance funding was not associated with a strictly “climate change” project; instead, it supported institutional strengthening components for a mass transit project. Furthermore, there do not appear to be any material differences between the transit infrastructure supported in a climate change projects and mass transit projects. (See Appendix) This suggests that all of the transit projects can in some sense be considered climate change projects, producing benefits along the same lines as those explicitly called out for climate change.

Table 3. World Bank urban transport project funding in Latin America, 2000-present, by country

Country	Projects	(US \$m)			
		Total project cost	World Bank loan	GEF grant	Carbon finance
Argentina	10	3,425.2	1,800.0	0.0	0.0
Belize	1	18.4	13.0	0.0	0.0
Bolivia	2	314.4	107.0	0.0	0.0
Brazil	5	2,759.9	893.3	0.0	0.0
Chile	4	80.2	65.0	7.0	0.0
Colombia	6	1,384.9	744.0	0.0	0.0
Costa Rica	1	79.7	72.5	0.0	0.0
Honduras	1	64.6	48.6	0.0	0.0
Jamaica	1	32.8	29.3	0.0	0.0
Latin America	1	79.3	0.0	20.8	0.0
Mexico	5	1,467.6	468.0	6.8	17.4
Nicaragua	1	69.9	60.0	0.0	0.0
Panama	1	100.0	50.0	0.0	0.0
Peru	2	142.3	45.0	7.9	0.0
TOTAL	41	10,019.2	4,395.7	42.5	17.4

Note: One regional climate change project has initiatives in multiple countries (Argentina, Brazil, and Mexico), and the World Bank classified its country as Latin America.

Significant proportions of the GEF financing in the portfolio were used to support project components associated with sustainable transportation. About 25 percent of the GEF funding in the portfolio supported walking and bicycling facilities; another 21 percent went to transit infrastructure, 18 percent to institutional strengthening; 14 percent to technical assistance; 8 percent to fleet improvements; 7 percent to travel demand management; 7 percent to project management; and less than 1 percent to a public campaign about climate change. Furthermore, the significant investment in institutional strengthening, technical assistance, and project management supports the planning and coordination needed to address the system-wide nature of climate change mitigation.

Overall, technical assistance components account for about two percent of expenditures across all urban transport projects, and institutional strengthening components about four percent across all projects. These components, as well as project management, are included in nearly all projects in this portfolio, and support tasks such as planning, background studies, data collection, and project evaluation. Although only two to four percent of all project spending goes toward technical assistance, the average technical assistance cost per project is USD \$4 million, and the average institutional strengthening cost per project is USD \$9 million.

Furthermore, institutional strengthening accounts for about 8 percent of the total World Bank lending in the portfolio, while accounting for only about 4 percent of the total project costs.

Alongside the portfolio's emphasis on urban transit, road building projects in urbanizing areas account for a significant proportion of the urban transportation portfolio. These road projects include investments in road infrastructure, as well as training and institutional strengthening in planning, safety, and asset management.

Table 4. Costs and Financing of Urban Transportation Projects in Latin America, 2000-2008, by Project Type

Project type	Total project cost		World Bank loan		GEF grant		Carbon finance	
	US \$m	%	US \$m	%	US \$m	%	US \$m	%
Climate change	105.3	1.3	0.0	0.0	33.4	80.8	0.0	0.0
Development policy loan	210.2	2.6	210.2	5.8	0.0	0.0	0.0	0.0
Mass transit	3,756.7	45.9	1,418.4	39.1	7.9	19.2	2.4	100.0
Mixed infrastructure	667.6	8.1	519.6	14.3	0.0	0.0	0.0	0.0
Municipal improvements	754.0	9.2	304.3	8.4	0.0	0.0	0.0	0.0
Road infrastructure	2,605.9	31.8	1,107.8	30.5	0.0	0.0	0.0	0.0
Water infrastructure	91.4	1.1	69.8	1.9	0.0	0.0	0.0	0.0
Share of total portfolio project cost								
TOTAL	8,191.0	100	3,630.1	44.3	41.3	0.5	2.4	0.03

Note: Two mass transit projects named climate change as a "theme" in their loan preparation documents but did not address greenhouse gas emissions explicitly in their presentation of the project components or in project evaluations. We classified them as mass transit projects, not climate change projects.

Table 5. Costs and Financing of World Bank Urban Transport Projects in Latin America, 2000-2008, by Component

Component	Total project cost		World Bank loan		GEF grant		Carbon finance	
	US \$m	%	US \$m	%	US \$m	%	US \$m	%
Community development & participation	6.7	0.1	2.5	0.1	0.0	0.0	0.0	0.0
Economic development	2.0	0.0	2.0	0.1	0.0	0.0	0.0	0.0
Fleet improvements	6.5	0.1	0.0	0.0	3.3	8.0	0.0	0.0
Freight rail infrastructure	6.6	0.1	5.9	0.2	0.0	0.0	0.0	0.0
Institutional strengthening	361.9	4.4	285.0	7.9	7.5	18.2	2.4	100.0
Mixed infrastructure	589.2	7.2	285.7	7.9	0.0	0.0	0.0	0.0
Non-motorized transport	20.8	0.3	1.4	0.0	10.5	25.3	0.0	0.0
Project management	59.2	0.7	29.6	0.8	2.7	6.5	0.0	0.0
Public campaign	0.3	0.0	0.0	0.0	0.2	0.4	0.0	0.0
Rail infrastructure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roads	2,828.7	34.5	1,279.2	35.2	0.0	0.0	0.0	0.0
Social service provision & facilities	19.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Technical assistance	166.4	2.0	83.4	2.3	5.7	13.8	0.0	0.0
Transit infrastructure	3,839.9	46.9	1,435.7	39.5	8.6	20.9	0.0	0.0
Travel demand management	6.3	0.1	0.0	0.0	2.8	6.8	0.0	0.0
Water infrastructure	277.1	3.4	219.7	6.1	0.0	0.0	0.0	0.0
Share of portfolio total project cost								
TOTAL	8,191.0	100.0	3,630.1	44.3	41.3	0.0	2.4	0.0

4. Practitioner Perspectives on Project Development

Our interviews with World Bank staff members, former staff members, and consultants raised a number of issues about the extent to which, and how, the project development process integrates climate change considerations into projects. The interviews also examined non-lending approaches to climate change mitigation in urban transportation that highlight the World Bank's non-lending roles, namely its work in technical assistance.

First, World Bank staff expressed a sense of constraint because projects are mostly locally generated, rather than initiated by World Bank staff. Furthermore, it is increasingly the case that the proposals are well defined and detailed when they are put forward to the World Bank for consideration, and as a result many Bank staff see their role in shaping projects as quite limited. World Bank staff attributed the increasing detail in proposed projects to the increasing depth and sophistication of local technical capacity. But if climate change is not a priority for those who are proposing the project, then World Bank staff see themselves as having few and limited opportunities to adjust a project to be less carbon intensive. The World Bank project cycle includes phases that rely on negotiation to shape investment priorities as well as a project and its components, but the organization's direct influence on projects has limits.

World Bank staff expressed enthusiasm on the topic of technical assistance grants. While projects funded by loans are mostly locally initiated, World Bank staff members have more flexibility to use technical assistance grants administered by the World Bank (and sometimes partly funded by the World Bank, though mainly funded by other sources) to support policy design and development, planning process development, institutional design, data collection, studies for project preparation, training in project design and evaluation, and information exchange including peer group exchanges. In addition, staff members actively engage with partner countries through technical assistance arrangements. According to our interviews, this is how the World Bank maintains "long-term engagements" with clients and form relationships that may influence the projects that partner countries eventually propose. For example, a technical assistance project in Panama produced an urban transportation policy strategy for the city. This project arose because of existing professional networks. The policy strategy was classified as only a "study", and although the city government did not officially adopt it, the professional contacts developed through the study have been lasting despite political changes. Furthermore, the work has lasting influence as a reference on urban transportation policies and practices for Panama and other cities.

Several interviewees talked about the role of the World Bank in influencing policies by providing expertise. In their view, the World Bank shapes the design and selection of projects through policy discourse, both by providing expert opinion that can influence decision-makers and by providing data and analyses that decision-makers can use to reach their own conclusions. These staff members saw the World Bank's own expertise in the urban transportation policy arena — in air quality, bus rapid transit, institutional design, and carbon calculations—as an important part of the broader project development process because it helps shape country and city policy. Several saw expertise as a tool that the World Bank should be using to introduce climate change mitigation into the discourse in the Latin American region.

Interviewees had different views on how climate change expertise might be introduced. Some talked of using a "champion to convince key stakeholders" with evidence and then following up with grants to support the development of projects — i.e., expertise was associated with persuasion. This is the way that they "make a difference and get good results." Others

emphasized providing technical data and analysis to support the policy process while remaining “outside” of the ultimate decision-making process. Regardless of their policy styles, most interviewees place a very high value on quantitative indicators and evidence, even though many acknowledge that some of the most important outcomes of their work are not measurable quantitatively.

It follows, then, that indicators of performance and evidence of local benefits are important means of influencing local stakeholder proposals and actions. Interviewees said that evidence of a climate change project’s potential impact is necessary for demonstrating the merits of projects to other actors such as the boards that award grants (e.g., the Global Environmental Facility (GEF)), internal management, and external evaluators). In addition, interviewees cautioned that another crucial point for climate change issues is to convince local stakeholders that local benefits can accompany strategies that reduce greenhouse gas emissions.

World Bank policy and financial instruments also play an important role in increasing attention to climate change issues. Interviewees described how the internal World Bank policies about climate change influence their increasing interest in using climate change-related financial instruments. Several World Bank staff have personal and professional opinions that, in general, countries in Latin America should not use loans to pay for climate change mitigation projects because loans should be used for local priorities, and because they believe other countries and regions (the US, the EU) should take primary responsibility for the costs of climate change mitigation. Instead of loans, these staff members prefer to use grants to fund climate change work, at least for now. While recognizing the importance of the climate change issue, some staff members also contested prioritizing climate change ahead of other “traditional” transportation goals including economic development, social equity, and environmental improvement. In theory, the goal of mitigating climate change does not necessarily compete directly with other transportation goals, but in current practice climate change competes for project resources (e.g., applying for grants, collecting data, conducting analyses), and can also be at odds with local political agendas, making it difficult to pursue directly.

Some of the staff did recognize that many transit and traffic management projects can reduce carbon emissions. Nevertheless they believed that resource constraints work against the consideration of CO₂ emissions impacts in many projects. Analyses cost money, and making an explicit link to climate change in a project is sometimes seen as a lower-priority use for scarce project resources, and even one that could delay or destroy the project. “Technical resources are scarce on this project. The team has four people. If one starts to work on certifying emissions, then giving up that one person kills the project.” Introducing climate change mitigation components to existing projects would be resisted by the borrowers, and by the project managers, too, if the additional work would be a large hassle for only a minor piece of a project. Thus, funding climate change mitigation is not only a matter of directing resources to the capital requirements of projects, there are also important labor constraints that limit the capacity to do climate change work.

However, the development of new grant instruments, such as the new Clean Technology Fund, is an indicator of the growing status of climate change policy within the World Bank. The financial instruments created to fund climate change work institutionalize climate change policies and provide incentive for their inclusion in local projects, although they also treat them as “special efforts” rather than a new but ongoing part of the planning process. Other trust funds support climate change work, especially through technical assistance, and those that World Bank staff have used to support urban transportation in Latin America include the Global

Environmental Facility (GEF), Japan Policy and Human Resources Development Fund (PHRD), and Bank Netherlands Partnership Program (BNPP).

Another important factor is that the World Bank's orientation toward projects does not easily lend itself to consideration of systems effects, though improved data and models offer increasing opportunities for such analyses. If achieving a broad policy goal such as reducing greenhouse gas emissions requires a systems level assessment, then this suggests that coordination and integration across projects is critical. However, high-level planning documents such as the CAS (or CPS) do not currently serve this function, and project level analyses typically cannot make all the connections that would be needed to fully account for system effects. Many interviewees spoke about the fragmentation and idiosyncrasies that emerge from a project-based strategy to address complex policy issues such as air quality or greenhouse gas emissions, noting that a single project is too limited in scope to tackle these issues fully.

The bright spot here is that an increasing number of Latin American cities and countries are developing modern modeling systems and databases on urban travel, in part with technical assistance and lending from the World Bank. These models and data do support systems analyses and can greatly improve the quality of project analyses without greatly increasing costs.

Most of the interviewees thought that more integration or urban systems planning would benefit their project work. On the other hand, staff members also think that increasing the complexity of an already complex (and resource constrained) project by working across sectors and disciplines is a risk to projects that are already challenging to implement. Also, some interviewees said that the project focus is beneficial because it allows project managers to move forward expeditiously and to demonstrate key results (even of some of the secondary impacts are not accounted for).

5. World Bank Environmental and Economic Reviews of Projects

Creating estimates of the potential carbon savings from carbon is a key factor in obtaining funding for climate change projects. In addition, CO₂ savings could be counted as benefits in project evaluations. The World Bank's project development process includes formal procedures for forecasting and mitigating potential negative impacts of the projects the Bank funds, but these reviews do not include carbon emissions at this time.

World Bank's local partners, staff, and consultants consider potential impacts of projects during their preparation, appraisal, and post-implementation evaluation. Each of these steps presents an opportunity to integrate information about expected carbon emissions from projects. Here we discuss the current evaluations and comment on where CO₂ evaluation could be introduced or strengthened.

As a preliminary step, CAS (or CPS) documents could discuss carbon emissions and climate change policy. For example, Mexico's CPS document discusses Mexico's leadership on climate change issues. It also sets forth CO₂ emissions goals under the larger "Environmental Sustainability" goal, and mentions that the World Bank has 25 ongoing climate change initiatives in Mexico. Although Mexico's CPS includes these ideas, their inclusion is not a widespread practice. (World Bank, 2007)

Pre-implementation appraisals include in-depth social and environmental impact analyses that act as “safeguards”. Each appraisal checks whether any of the Bank’s safeguard policies are “triggered”. These safeguard policies focus on the following topics: environmental assessment, natural habitats, pesticide use and pest management, cultural property, involuntary resettlement, indigenous peoples, forests, safety of dams, projects in disputed areas, and projects on international waterways. Interviewees characterized these safeguards as “regulatory” tools in the sense that they are restrictive. Nevertheless, these appraisals are among the current World Bank practices for evaluating project impacts, and they provide an opportunity for carbon emissions assessment, which is not currently required as part of each project’s environmental assessment. The next two sections describe the environmental and economic reviews in more detail.

A. Environmental Review

World Bank operational policy requires environmental assessment for all projects. These assessments’ goals include evaluating the project’s potential risks and impacts, considering alternatives, and informing the design and implementation of the project. The environmental assessments consider local impacts, as well as “transboundary global environmental aspects” such as climate change. (World Bank, 1999) Depending on the potential impacts identified during an initial screening, a project may be subject to one or more of a variety of assessment instruments. World Bank policy also states that when a borrower does not have sufficient institutional capacity to participate in the environmental review identified by the World Bank, then the project will include institutional strengthening in this area for the borrower.

We reviewed the environmental and social assessments included in the Project Appraisal Documents for the 41 urban transportation and metropolitan development projects funded over the eight-year study period. These documents summarize the environmental evaluations and plans, but do not present the full environmental assessment for each project. These environmental reviews focused primarily on the protection of local project impact areas, and were concerned with limiting the scope of the impact by operating within existing rights of way, for example.

These documents also report on potential environmental benefits from projects, including improved air quality from lower emissions or air pollutants. The air quality studies estimated the additional or saved emissions compared with a baseline scenario. The analyses also considered the short, medium, and long run effects of projects. When projects (3) were funded with climate change-related instruments such as the GEF, the assessments included forecasts of the reductions in greenhouse gas emissions expected for the project. Otherwise, greenhouse gas emissions were not analyzed for the projects in our dataset. This is an area in which technical capacity could be directed to producing estimates of greenhouse gas emissions, as well as other relevant impacts such as car use, and urban development patterns for a baseline scenario and for project alternatives.

B. Economic Review

The World Bank conducts economic evaluations of projects to determine their “acceptability”, and these evaluations follow a cost-benefit approach comparing the discounted expected present value of the net benefits of a project scenario compared to alternative scenarios, including doing nothing. The analyses use country-specific discount rates in the range of 10%, projecting costs and benefits 10 years into the future for paving interventions, 20 years into the future for roads, transit and non-motorized transport projects, and 30 years for water, sewerage,

and drainage projects. The evaluations also consider non-monetary benefits of projects. (World Bank, 1994)

The Project Appraisal Documents available for the projects in the urban transportation portfolio reported summaries of the economic evaluations, and these included analyses of at least two scenarios – with and without the project – and sometimes included other alternatives depending on the uncertainties of the project at the time of the evaluation. According to interviews with World Bank staff, the World Bank staff and partners from the borrowing country work through comparisons of a wider array of alternative scenarios during the early preparation phases of a project and these methods and scenarios are not necessarily included in the publicly available project records.

Regarding carbon emissions and climate change mitigation, the World Bank operational policy for economic evaluation states that:

“A project's global externalities—normally identified in the Bank's sector work or in the environmental assessment process—are considered in the economic analysis when (a) payments related to the project are made under an international agreement, or (b) projects or project components are financed by the Global Environment Facility. Otherwise, global externalities are fully assessed (to the extent tools are available) as part of the environment assessment process and taken into account in project design and selection.” (World Bank, 1994)

Without seeing the full economic analysis for each project it is difficult to capture information about all of the assumptions and decisions that were part of the method of modeling, but we do want to call attention to the patterns that we found in the evaluations summarized in the project documents.

The projects that we reviewed that addressed roads—either through asset management programs or municipal works—identified reductions in vehicle operating costs, road maintenance expenditures, and travel time as key benefits. These projects used the Highway Development and Management model (HDM-4 in most cases, or sometimes HDM-3) to estimate the value of these benefits. The HDM-4 model can also model vehicle emissions, including factors for vehicle age, congested conditions, and other variables, but emissions were not treated in the roads project analyses we reviewed. (Bennett and Greenwood, 2001)

Urban upgrading projects evaluated transportation improvements by analyzing their effect on property values using hedonic price models. One project found that the sidewalk, stairway, and road improvements (considered together) increased monthly rents by 27%. (World Bank, 2006) Projects also considered the fuel savings from trunk road improvements (due to increased speeds). However, despite the sophistication of the analyses carried out, the project managers did not take them to the next step: asking what effect on the rent increases would have on location choices and mode shares, or how induced demand for the trunk road or any modal shifts or location shifts would affect traffic and speeds, and thus emissions.

Urban mass transit projects analyzed time savings benefits for all modes, various reductions in costs, the benefits of trips generated by the new service, and reductions in air pollution and traffic crashes due to mode shifts to transit and transit improvements. Based on the descriptions of methods in the appraisal documentation, the evaluations used different methods depending on the quality and availability of data. One project explicitly used EMME/2 to model regional transportation, and other projects used simpler estimates. Most projects had data

about average daily traffic and transit level of service. However, in some cases, the consultants doing the evaluations needed to collect original data to make their estimates.

Calculations of the benefits of air pollution reductions accounted for passengers shifting from bus to rail, and fleet upgrading, but did not always include emissions saved from shifting auto trips to transit. This may be the result of demand analyses that show minimal switching from auto trips to transit trips as a result of the improvements or it could be a lack of data on mode choice. The details were not reported in the documents we reviewed.

The climate change projects' appraisals measured a range of benefits consistent with other similar projects, and included additional analyses of CO₂ emissions savings. Again, the methods for making these estimates ranged from regional modeling to simpler analyses, depending on the availability and quality of data.

Two of the climate change projects used a simple ASIF approach (Schipper, Marie and Gorham 2000)—where ASIF stands for estimates of activity “A”, in total vehicle kilometers, shares by mode “S”, intensity “I” or fuel use/km for each mode and fuel, and fuel type “F’s” CO₂ content—to estimate changes in fuel use and CO₂ emissions due to the projects. For one GEF project the analyst used ASIF to estimate the reduction in greenhouse gas emissions in an urban transportation environment that would result from the implementation of a hypothetical, representative BRT system. A second GEF project used the ASIF approach to estimate the overall project impact on CO₂ emissions, and noted that this would be the method used throughout the project for CO₂ assessments. In each case, the analysts used a combination of data and measurements both from project cities and from other comparison cities to construct the scenarios and support assumptions.

Interviewees discussed the challenges they have had quantifying the benefits of GEF-funded studies, land use and transportation planning integration, and bicycle and pedestrian projects, particularly when compared to vehicle and fuel interventions they considered to be more certain and measurable. They suggested that the complexity of urban transportation hinders their ability to demonstrate benefits that they expect to create.

None of the evaluations of climate change-related projects accounted for potential changes in settlement patterns, origin-destination patterns, or trip generation rates in their estimation of travel demand or benefits, and only two considered increasing motorization in their models (one other project assumed that motorization would decrease). While the models did not include any of these topics in their estimates, these topics were nonetheless discussed with more depth in the climate change and mass transit projects than in roads or urban services projects. The climate change and transit documents discussed the relationships between greenhouse gas emissions, motorization, urbanization, and transportation investments, but the road project documents did not mention these relationships.

Even without applying integrated land use and transportation models, these economic evaluations could more consistently base modeling decisions and assumptions on local patterns of urban growth and motorization. For example, road infrastructure projects that add capacity in the undeveloped part of a metropolitan region, especially when the projects are located close to airports or other centers of industrial and commercial production, should consider the influence of urban traffic on surface deterioration, speeds, traffic flows, and multimodal access. Transit infrastructure projects sometimes consider changes in land value, and they should also account for the development and changing location patterns they are likely to induce. Location and land use changes could affect assumptions about traffic volumes, speeds, and ridership and also

could affect CO2 emissions. These considerations should be part of the economic evaluation as well as the design of the projects.

The methodology for such evaluations could range from an integrated transportation land use models applied to travel and activity survey data, to simpler methods that use information on findings from previous “comparables” to estimate the magnitude and range of impacts likely to occur. This is where technical assistance and expertise—within the World Bank, its project staff, and in partner countries—could be used to integrate climate change mitigation into projects.

6. Summary and Discussion

How is the World Bank responding to climate change in its urban transportation operations in Latin America? It is responding by obtaining GEF and other grants for projects where they can demonstrate carbon emissions savings easily, such as through technology changes. However, in the period analyzed and the set of projects identified as urban transport focused, GEF grants amounted to only 0.5% of the total expenditure on urban transportation projects (USD \$41.3 million out of a total USD \$8.2 billion) while World Bank loans accounted for about 44% total expenditure. It is also responding by securing other grants for studies and pilot programs that emphasize land use, urban development, urban mass transit, and non-motorized travel. Yet, these projects do not account for a significant proportion of all of the project funding directed toward urban transportation. Furthermore, more than one third of the project funding for urban transportation is directed toward roads, without any analysis of their affect on long run changes in urban development, mode share, and carbon emissions. Overall, transit projects are doing a somewhat more sophisticated job of modeling systems effects than are highway projects. Both could strengthen the treatment of secondary impacts due to “feedback” effects, especially with regard to location and land use shifts.

Nevertheless, the urban mass transit projects that account for the majority of the urban transportation portfolio do include facilities and planning for non-motorized transportation, some attention to land use and settlement patterns, as well as funding for transportation and land use planning, studies, and capacity building. By pursuing a range of established transportation goals (e.g., accessibility, equity, sustainability) the World Bank’s urban transportation is in all likelihood supporting carbon reductions, but the projects do not allocate resources to demonstrate this. Carbon analyses were included in the public evaluations for only three of the 41 projects we examined.

World Bank policy and financial instruments can and do play an important role in increasing attention to climate change issues, yet project resource constraints may work against the consideration of CO2 emissions impacts in many projects, especially if doing so is resource intensive. Making CO2 analysis a standard evaluation element for all projects and investing in analytical tools that have multiple applications may reduce the resistance.

World Bank staff use technical assistance as an alternative to pursuing climate change mitigation directly through project lending arrangements. This technical assistance aims to provide information about mitigation strategies and to build skills in sustainable transportation planning and evaluation. Information and capacity, it is hoped, will tend to support a greater level of consideration of climate change issues in future project development. Using grants instead of loans can be a more acceptable way to introduce climate change considerations

when a country's or city's political agenda does not explicitly address climate change mitigation, and grants are more flexible than loans.

The World Bank also can shape projects by influencing policy discourse, both by providing expert opinion that can influence decision-makers and by providing data and analyses that decision-makers can use to reach their own conclusions. Indicators of performance and evidence of local benefits are important means of influencing local stakeholder proposals and actions, but these benefits can be difficult to quantify when they involve land use, livability, non-motorized transport, and other aspects of urban transportation that have often lacked consideration in mainstream transportation policy and planning debates.

The World Bank's orientation toward projects does not easily lend itself to consideration of systems effects, but improved data and models offer increasing opportunities for such analyses. Projects that are explicitly designed to reduce carbon often include a significant share of funding for institutional strengthening and technical assistance to do analyses and support the costs of including climate change considerations in transportation planning. However, many estimate the potential benefits of the projects using highly simplified approaches that cannot capture secondary and tertiary impacts except through exogenously specified scenarios. A few other projects, not necessarily climate change projects, are using formal transportation demand models and these models could be applied more widely to climate change projects when accompanied by additional support for data collection.

In short, over the 2001-2008 period, the World Bank's urban transportation practice in Latin America assisted more projects that have likely carbon benefits than it is taking credit for, in large part because the analysis of carbon emissions had not been integrated into the data gathering, modeling and evaluation process. In addition, the World Bank was not examining the effects of its roads projects on future urban development and long run patterns in carbon emissions. This may be because the World Bank maintains a distinction between roads projects and urban transportation projects, even when the World Bank funds roads projects in urban areas. Roads projects account for the majority of the World Bank's transportation lending, including asset management projects as well as rural roads projects. (World Bank Independent Evaluation Group, 2007) Bringing a carbon perspective to the roads work would not necessarily mean building fewer roads or inhibiting access to markets. Rather, it could mean designing roads that could adapt to future urbanization by allocating space for future transit access, pedestrian and bicycle facilities, and land uses. Unfortunately, because this project focused on urban transportation as it is defined organizationally in the World Bank we did not have access to World Bank staff who work on roads projects. Future work on this topic should remedy this omission.

Taking these points together, a strategy for increasing carbon consideration in World Bank projects would be as follows:

- Explicitly include carbon emissions as one of the specific issues analyzed in high-level planning processes and documents, such as the Country Assistance (or Partnership) Strategies as well as in environmental assessments and Project Appraisal Documents.
- Introduce assessment of the system effects of projects, including induced travel and land use shifts, by conducting at least some analysis for the subset of projects outlined in the Country Assistance Strategy that will take place in a particular urban area, and by assessing major projects in the context of their system effects using the methods outlined earlier.

- Include technical assistance and institutional strengthening elements to provide the data and models needed to do both better travel forecasting and better environmental assessment for metropolitan regions as well as for individual projects. Improved data and models will allow local officials to more accurately estimate the transport impacts of policies and projects, accounting for their broader effects, and to tie those impacts explicitly to carbon emissions as co-benefits.
- Develop examples and data on projects' impacts on carbon reduction, based on world experience in modeling and measuring impacts, that the Bank staff can support as credible and reasonably applicable to the Latin American context. Progress toward this has been made already for examples of mass transit projects, but other treatments such as pedestrian and bicycle improvements and strengthening local land use planning institutions would benefit from more analysis and documentation.
- Help establish "networks of knowledge" through which practitioners and other experts can share information on projects that have been successful, methods for analysis, etc. When the project budget, data, or technical resources put formal modeling out of reach, use sketch planning methods, including simple calculations, to assess carbon emissions and check the results against evidence from comparable projects.
- Introduce climate change mitigation strategies into metropolitan road projects, and include training in complete streets design strategies in addition to the typical issues of road asset management and privatization. This is an area in which the urban transportation portfolio could be coordinated to better integrate urban development and transportation planning.
- Assess carbon emissions from all projects, not just those seeking special funding for carbon reduction. Make carbon emissions analysis a standard analysis result to be produced and reviewed in evaluating projects.

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8. Appendix

Elements of Project Components, by Component and Project Type, Urban Transportation Portfolio 2000-2008

Component, project type	Elements of the components
Community development, participation	
Mass transit	Transit operator involvement.
Municipal improvements	Community participation, supervision and auditing of community participation, land regularization, contingency planning, resettlement.
Economic development	
Mixed infrastructure	Local marketplace infrastructure, technical assistance.
Fleet improvements	
Climate change	Vehicle acquisition.
Mass transit	Bus replacement, fleet reduction and scrapping.
Freight rail infrastructure	
Mixed infrastructure	Freight rail infrastructure, technical assistance.
Institutional strengthening	
Climate change	Climate change assessment methods, project preparation, project implementation, integrating climate change issues into planning, transit planning, water planning, solid waste planning, plan integration, organizational reform.
Institutional strengthening	Contracts, competitiveness, project management, regulatory strengthening, organizational reform.
Mass transit	Corridor performance monitoring, bike parking, national transportation policy and plan development, policy studies.
Mixed infrastructure	Administrative restructuring, planning bureau strengthening, tourism promotion, financial management, government facilities, strategic planning, urban works, monitoring and evaluation.
Municipal improvements	Asset maintenance, environmental management, traffic engineering, monitoring and administration of public transport, environmental health policy development, air pollution policy development, air quality planning, air quality monitoring and equipment, air quality monitoring information network, technical assistance, disease prevention, urban planning policy development, sectoral coordination, development of indicators, drainage regulation, mobility planning, planning process improvements, solid waste policy implementation, water policy development, water quality lab accreditation, technical assistance, administrative development, environmental assessment policy.
Road infrastructure	Install HDM-4 model, decentralize road administration, road finance mechanism, toll roads, training, road ministry institutional strengthening, planning, budgeting, road safety, information technology, environmental management, project evaluation, road network surveys, road sector governance action plan, monitoring, evaluation.
Water infrastructure	Flood preparedness policy development, water policy development.
Mixed infrastructure	
Mixed infrastructure	Building restoration, park rehabilitation, tourist center, pedestrian paths, sports fields rehabilitation, sewerage and drainage, environmental restoration.
Municipal improvements	Basic water supply and sanitation, road rehabilitation, road maintenance, road widening, roads technical assistance, sidewalks, transit stops, street lighting, road drainage, sanitation facilities, community recreation facilities, childcare facilities, supervision and audits of infrastructure projects, water supply, solid waste management, home improvements, replacement housing, community safety

program, parks, low cost housing finance, engineering design, consulting and supervision, land regularization, urban policy development, bus feeder routes, non-motorized transport infrastructure, neighborhood improvements, microfinance services.

Non-motorized transport	
Climate change	Pilot investments in bicycle and pedestrian infrastructure, technical assistance, bicycle promotion, bicycle safety education, program monitoring and evaluation.
Mass transit	Bicycle and pedestrian infrastructure and facilities.
Municipal improvements	Bikeways, sidewalk improvements.
Public campaign	
Climate change	Public campaign.
Rail infrastructure	
Mixed infrastructure	Rail infrastructure, institutional design.
Roads	
Mass transit	Road infrastructure, paving.
Mixed infrastructure	Road rehabilitation, road widening, enhancing intersection, removal of bottlenecks, routine maintenance, maintenance program development, bypasses, bridges.
Municipal improvements	Trunk roads, ring roads, canal, bridge, drainage improvements, lighting.
Road infrastructure	Trunk road rehabilitation, road stabilization in competitive regions, road maintenance program, bypass/airport road, road maintenance, bridge rehabilitation, supervision programs, maintenance pilot program, civil works, consulting services, trucking control station, rehabilitation of secondary roads, road maintenance account, technical assistance, pilot corridors safety program, safety infrastructure, safety design.
Social service provision, facilities	
Municipal improvements	Community development, facilities: design, operation, management.
Technical assistance	
Climate change	Goods movement investigation, urban freight issues, land use, transport and environmental planning integration, bus technology evaluation, bus fleet renewal, land use studies, climate change in transport design.
Mass transit	Management and oversight of infrastructure, financial management and oversight, finance studies, transport demand analysis, model updates, design of institutional framework, metropolitan road maintenance study, fare optimization study, GIS pilot, travel time data collection, communication plan, design of an air quality monitoring and information system, transport policy framework, BRT planning, implementation capacity, technical support (e.g., audits, design, analysis), bus operator reorganization, impact and feasibility analysis.
Mixed infrastructure	Sectoral analysis, economic development policy design, pilot project/policy implementation, technical engineering feasibility, design and benchmarking, city strategic plan, monitoring and evaluation, studies.
Municipal improvements	Studies: local economic development, project management, supervision and evaluation, road infrastructure administration, neighborhood improvement program development, air pollution program development, fiscal management, project management, auditing and evaluation, transit policy, safety policy, public safety, mediation and conflict resolution, vocational training, family support, youth development, community development.
Road infrastructure	Transport sector studies, zoning and urban development, road safety strategy, project supervision and evaluation, pre-investment studies, audits, project preparation, consultants' services, training, regional coordination, environmental capacity: environmental and social impacts of road construction, studies, project evaluation, education program.
Transit infrastructure	
Climate change	Pilot investments in transit improvements, technical assistance, bus lanes, sidewalks, stations, lane reorganization, feeder road paving, bus technology,

	control center.
Mass transit	Road-rail crossings, grade separation, multimodal station access improvements, transfer centers, station improvements, painting, parking, signalization, illumination, furniture, bus stops, ramps, fences, bike parking, sidewalks, pathways, drainage improvements, bike paths, road crossings, pedestrian bridges and tunnels, paving, elevators, historic preservation, metro construction, bridges and viaducts, road works, metro operation, metro equipment, rolling stock, control system, electrification system, metro maintenance, BRT corridor construction, segregated busway, regulatory framework, resettlement, traffic management, organizational management, technology promotion, operator concessions, project management and supervision.
Municipal improvements	Paving transit feeder streets, technical assistance, institutional strengthening for BRT, transit policy, safety policy, busways, feeder routes, bike paths, sidewalks, non-motorized transport planning.
Travel demand management	
Climate change	Technical assistance: rationalization of the automobile.
Water infrastructure	
Mixed infrastructure	Water, drainage, sewerage, sanitation.
Water infrastructure	Water, drainage, sewerage, sanitation.
Road infrastructure	Drainage.