

THE NATURE AND ROLE OF LOCAL BENEFITS IN GEF PROGRAMME AREAS

CASE STUDY



Pakistan *Fuel Efficiency in the Road Transport Sector (FERTS)*



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Authors

Jyotsna Puri, UNDP/GEF Monitoring and Evaluation Unit, New York, USA

Dr. Lee Alexander Risby (Case Study Manager & Team Leader) GEF Office of Monitoring & Evaluation, Washington DC, USA

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Jyotsna Puri – UNDP GEF
Lee Alexander Risby – GEFME

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Executive Summary

Objectives: Overall global environmental goal of the project is to reduce, at source, greenhouse gas emissions and other pollutants by improving the fuel efficiency of road transport vehicles. The project is implemented by UNDP and executed by National Energy Conservation Center (ENERCON) based in Islamabad.

Global environmental achievements: Since the beginning of the project in 1996, the project has resulted in the mitigation 129,333 tons of Co₂. This included a significant improvement in impact through 2001 – 2003 from 36,297 to 53,129 tons Co₂ as more demonstration tune up centres commenced operation. The project now has 27 demonstration tune-up centres, exceeding original targets. However, the project predicts that it would take 650 tune up centres to become operations to cater for Pakistan's road transport sector and this has the potential to mitigate 1.28M tons of Co₂ per year (*ce-teris paribus*).

Local benefits: The local impacts on financial, social and institution, and human capital have been significant. Many workshop owners (private sector) who have hosted demonstration tune-up centres found it added to their market visibility, expanded their customer base, built trust and led to repeat business, which has improved financial capital. Furthermore, vehicle owners have benefited from US\$9.048M in fuel savings. The project has helped establish networks with/in private sector (motor-cycle / automobile manufacturers, oil companies and workshop owners) and Government of Pakistan (GoP) thus building institutional capital to address fuel efficiency and local air pollution concerns. The project has also improved human capital through training of mechanics and workshop owners in the instrumented tune-up technology. This has also assisted in raising awareness and interest within the road transport service industry.

Market transformation: The project has yet to fully realize a significant transformation in the road transport sector from manual to instrumented tune-ups. The project has focused on the supply-side as an 'engine of market transformation' and so far it has relied on training mechanics and encouraging workshop owners to set up instrumented tune-up centres. 27 demonstration tune-up centres have been started, but mostly with large workshops and oil companies. Small to medium sized enterprises (SMEs) cannot afford to invest in tune-up equipment costing US\$7-10,000. The project has so far failed to operationalize the RLF to enable SMEs to access the tune-up technology and scale-up market penetration.

Policy framework: The project has produced and / or commissioned 19 technical studies to provide policy and legislative guidance to the GoP and also laid the foundations for policy changes through the establishment of a wide network of formal and informal relationships with the GoP, that provides a forum for discussion of the study outcomes. It is clear that without changes in policy and legislation governing areas such as motor vehicle inspection and standards, pollution coupled with enforcement there will be no 'demand push' to the market.

Access to finance: A major part of the project strategy has been to facilitate market transformation through improving access to finance for SMEs to purchase of tune-up equipment. The project estab-

lished a US\$3.2M RLF and this is presently awaiting disbursement, but due to administrative and bureaucratic hold-ups regarding the operation of the fund it is yet to become operational. Until SMEs gain access to finance through the RLF the project impacts are likely to remain relatively modest.

Business development: The project has strengthened capacities of SMEs – workshop owners (821) and mechanics (1567) through training in instrumented tune-up technology exceeding project targets. In a project survey 79% of mechanics reported that the training resulted in increased pay and a broadening of their customer base and increased customer satisfaction. Similarly, 76% of workshop owners stated that training (which results in a UNDP / ENERCON certificate) boosted business and increased their income. The training has raised expectations among SMEs – many of which are now intending to apply for financing through the RLF.

Awareness and Information: Since 1999 the project has engaged in an extensive awareness campaign on several levels. Firstly, to aimed at workshop owners and mechanics to publicize tune-up equipment and the advantages of investing. Secondly, publicizing the advantages of tune-up to road users emphasizing potential fuel savings and improvements in local air quality. The project has also focused on women drivers through offers of discounts at demonstration centers. Thirdly, the project has worked with WWF, Association of Road Users of Pakistan and Pakistan State Oil to implement a wider awareness program focusing on road safety and environmental protection.

In conclusion: Overall the project has exceeded its original *output* targets for tune-up demonstration centres, training and special studies to guide policy and legislative development. However, the impacts of the project have been modest particularly in terms of market transformation, but there remains a potential for rapid improvement once the RLF becomes operational. This also has to be matched with national policy and legislative changes coupled with implementation to provide a demand-push to individual and fleet vehicle owners. The main lessons that can be drawn so far are:

Use of GEF funds – technology push vs. technology pull: In the context of transport related projects it is important to question whether a FERTS-type project, which aims to transform a market in an urban setting by focusing on the private vehicle sector can be replicated within the GEF portfolio. This is for two reasons. Firstly, vehicular emissions are better controlled by altering behaviour such as reducing driving times, urban planning or exhorting a move to mass means of transportation. Frequently, increasing vehicular efficiency leads to increases in vehicular fleets or increases in driving distances. This nullifies the initial expected reduction in emissions. Secondly, particularly in the case of instrumented tune-ups, which are necessary for EFI system vehicles, it is ambiguous if a FERTS-type project is actually *incremental*. EFI vehicles can only be tuned using instrumented equipment. Arguably the ingress of instrumented tune-ups is inevitable. FERTS is well intentioned in that it is catalyzing this transformation. However the tension between technology push vs. pull remains and needs to be studied closely.

Replication and the importance of local benefits: It is important to recognize that procuring local benefits is important for project replication. Given the GEF mandate of achieving global environmental benefits, local benefits, where applicable should be admitted in a lexicographic manner i.e. it should be recognized that local benefits can strengthen the impacts of a project aimed at achieving global objectives.

Creating sustainable financing mechanisms in GEF projects remains a source of concern. Two main problems seem to often assail plans for financing mechanisms, especially in the climate change portfolio: First, that often these mechanisms such as RLF require additional supportive legislation to enable them. Repeatedly, such legislative mechanisms take a long time to set up. This is also true of the RLF in FERTS. Second, usually projects only plan to set up these financing mechanisms with little attention to their sustainability afterwards. Thus repayment capabilities and transforming the financial sector are seldom part of GEF project plans, or, even if they are, projects rarely reach this stage during their lifetime. Sustainability of financial mechanisms has to be thus grand-fathered by stakeholders after GEF has completed the project, often to little success. This must be remedied if GEF projects have to make long-term impacts.

Engaging the private sector: GEF projects must engage the private sector if they are to have any impact whatsoever. This emphasis on aligning itself with the profit driven private sector will also ensure

that project designs have attainable objectives and suitable sustainable financing mechanisms that are not subsidy driven in perpetuity.

Developing capacity at the local and national level via policy and legislation: To get the most returns for every dollar invested, it is suggested that GEF funds be spent on enabling legislation and building capacity within local and national governments.

Acronyms

ARUP	Association of Road Users of Pakistan
CCF	Country Cooperation Framework
CEDAW	Convention of the Elimination of Discrimination Against Women
DODO	Dealer Owned Dealer Operated
ECF	Energy Conservation Fund
EFI	Electronic Fuel Injection
ENERCON	National Energy Conservation Center (Ministry of Environment)
EPA	Environmental Protection Agency
EPD	Environment Protection Department
FERTS	Fuel Efficiency in the Road Transport Sector
GEF	Global Environment Facility
GoP	Government of Pakistan
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
JICA	Japan International Cooperation Agency
MoE	Ministry of Environment
MoF	Ministry of Finance
MTE	Mid-term Evaluation
MVE	Motor Vehicle Examiners
MVETS	Mobile Vehicle Emission Testing Station
NCSR	National Conservation Strategy Report
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
NHA	National Highways Authority
NISTE	National Institute of Science and Technical Education
NTRC	National Transport Research Centre
OP	Operational Program
PIR	Project Implementation Review
Prodoc	Project Document
PSO	Pakistan State Oil
RLF	Revolving Loan Fund
SEBCON	Socio-economic and Business Consultants
SuRF	Sustainable Resource Foundation
TPR	Tripartite Review
UNDP	United Nations Development Program
UNIDO	United National Industrial Development Organization
USAID	United States Agency for International Development
VETS	Vehicle Emission Testing Station
WHO	World Health Organization
WWF	World Wildlife Fund

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A. BACKGROUND

A.1 THE GEF LOCAL BENEFITS STUDY

The GEF is presently conducting a portfolio wide study designed to explore and understand the inter-relationship between local livelihoods benefits of GEF-supported interventions and the attainment of global environmental benefits. The GEF mandate incorporates the role of local benefits through its emphasis on sustainable development: *“The GEF shall fund programmes and projects which are country-driven and based on national priorities designed to support sustainable development”*. Thus GEF’s two largest implementing agencies, the UNDP and the World Bank, have policies that formally link their environmental activities to poverty reduction.

In this study, **local benefits** are defined as:

“Project outcomes, which directly or indirectly have positive impacts upon people and ecosystems within or adjacent to project areas, and which provide tangible gains in the livelihoods of communities and the integrity of ecosystems.”

The study is designed to explore the following dimensions of selected projects in the GEF portfolio:

- ▶ The nature of links between attaining **global environmental benefits and generating local benefits**. This is based on an analysis of how global environmental benefits can affect benefit streams at the level of project area communities and how the generation of local benefits can affect the attainment and sustainability of global environmental goals. **Global environmental benefits** of the projects are assessed in relation to specific project design objectives.
- ▶ The types and scale of **local (livelihoods) benefits and of any negative impacts**, intended or unintended, which have resulted from GEF projects, including local perceptions of these impacts.
- ▶ The extent to which project design and the environmental management options selected in the project **can maximize opportunities** to generate greater levels of local benefits, or can **miss** or not sufficiently exploit such opportunities.

The justification for examining these issues is to assist in increasing the long-term sustainability of global benefits in sensitive areas by enhancing the level of direct and tangible gains accruing to local communities and actors in future GEF policy, strategies and programmes, within the requirements of the GEF mandate. Specifically, the overall **purpose** of the study is to contribute towards:

- ▶ Enhancing GEF **policies, strategies and project design and implementation**, in order to fully realize the potential for local gains in global environmental programmes, to mobilize local actors for long term support to sound environmental management, to reduce local costs incurred by local communities for supplying global environmental goods, and to ameliorate possible negative impacts.
- ▶ Strengthening GEF **M&E policies and processes** to identify indicators for and strengthen the tracking of local benefits and negative impacts.
- ▶ Expanding the body of existing **operational knowledge** about **good practices** and experiences germane to pursuing global environmental issues, and of constraints or fallacies to be avoided in operations.

The Fuel Efficiency in the Road Transport Sector (FERTS) Project in Pakistan was selected as a case study because of its potential for demonstrating links between improving local livelihoods and attaining and sustaining global environmental benefits, and therefore for providing important findings, lessons and recommendations for both, GEF and the FERTS project. The study team consisted of a GEFME specialist (Team Leader) and a UNDP/GEF Monitoring and Evaluation/Climate Change specialist. No local consultant was used for this study.

A.2 MISSION OBJECTIVES

The study mission focussed on three aspects of the FERTS project germane to the local benefits study:

- a. Impact of the project on **policy and legislation** in areas of transportation, air quality and environment (examining links between local and global benefits);
- b. Impact of the project on **local livelihoods** which include:
 - Capacity development via training and awareness creation (impact on social and institutional/human capital) and;
 - Changes in quality and quantity of fuel use, direct and indirect impacts on income and employment (impact on financial capital);
- c. Impact on **local environment** and air pollution (impact on natural and human capitals).

A.3 POLICY AND INSTITUTIONAL BASELINE

This section reviews the state of environmental policy and enforcement in Pakistan.

Environmental regulation in Pakistan is fairly recent. Briefly, the following environmental protection related legislations have been introduced in the country:

- Pakistan Environmental Protection Ordinance, 1983
- National Environmental Quality Standards (NEQS), 1993
- Pakistan Environmental Protection act, 1997
- National Environmental Quality Standards (NEQS), Revised, 2000

The first environmental policy/legislation in Pakistan, the Environmental Protection Ordinance, was introduced in 1983. Since then, very few institutional, policy and regulatory developments have taken place at federal and provincial levels. These include the creation of the Ministry of Environment (MoE), the Pakistan Environmental Protection Agency (EPA) and the Pakistan Environmental Protection Act in 1997. The first provincial EPA was formed only in 1987.

In 1993, Pakistan instituted National Environmental Quality Standards (NEQS) on municipal and industrial solid wastes, liquid industrial effluents and industrial gaseous emissions. The NEQS also included standards for vehicular emissions and noise. These standards mandated the level of smoke, noise and carbon monoxide from vehicular emissions. In 1997, after some modifications these were transformed into an Act and remain the standard today (see Table 1).

On the whole, environmental regulation for the two relevant sectors – the transport sector and the industrial sector – has been a combination of command and control methods that has included self-monitoring, reporting and pollution charges. This has met with mixed success. For example, in the pilot phase of self-monitoring and reporting (SMART), fifty industries volunteered to provide data into a central database that transferred data between the Federal EPA and industry. The demonstration was successfully completed in 2001 for a period of 6 months – but it could not be expanded due to delays in setting up modalities for a launch on a larger scale. However this pilot attempt was not successful because reporting frequency differed across industry groups. Standards on industrial emissions were also revised in 2000, because they were decried as being “too stringent”.¹

Enforcement of environmental regulation has historically been very lax and vehicle emission regulation is particularly hampered by lack of enforceability. Currently, although most officers of MoE are aware of Euro 4 and the anticipated Euro 5, most affirmed that similar regulation with respect to all components i.e. CO, HC and NOX, and more importantly, its enforceability, was a long way away in Pakistan.²

Table 1: National Environmental Quality Standards for Motor Vehicle Exhaust and Noise, Pakistan, 1997³

Parameter	Standards* (maximum permissible limits)	Measuring method
Smoke	40% or 2 on the Ringlemann scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance of 6 meters or more.
Carbon monoxide	New vehicles: 4.5% Used vehicles: 6%	Under idling conditions: Non-dispersive infrared detection through gas analyzer.
Noise	85 db (A)	Sound meter at 7.5 meters from the source

It is hard to quantify the impact of lax enforcement on local air pollution because of lack of sufficient and comparable data. Pakistan has only five air quality-monitoring stations and they all measure different pollutants at different points of time. This lack of robust data and therefore mixed perceptions regarding possible sources of air pollution, are responsible in part for the lack of urgency with respect to air pollution policy. To redress this somewhat, JICA recently carried out a study of ambient air quality in Lahore, Rawalpindi, and Islamabad to assess pollution levels in traffic-congested areas, while also agreeing to finance the establishment of air quality monitoring stations in the country. The study revealed that the average suspended particulate matter in these cities was 6.4 times higher than WHO guidelines and 3.8 times higher than Japanese standards. On the other hand levels of sulphur dioxide, oxides of nitrogen and carbon monoxide were found to be below WHO guidelines. Other policy studies do not consider vehicular emissions to be critical although air pollution is recognized. The National Conservation Strategy Report of 2000 (NCSR 2000) does not mention vehicular emissions as an important source of pollution. But it does find that air pollution has been increasing over time and that vehicle emissions are one of its many contributors.

In the past however, policy studies have expressly focussed on vehicular emissions. The NCS Report in 1992 (NCSR 1992) railed against lax vehicular emissions regulation in the country, citing vehicular emissions as responsible for 90% of all pollutants in the country. The report estimated that levels of air pollution in two of Pakistan’s largest cities, Karachi and Lahore, were 20 times higher than WHO stipulated safe levels. It stated that the average Pakistani vehicle emits 25 times as much carbon monoxide as the average U.S. vehicle, 20 times as much hydrocarbon and more than 3.5 times as much nitrous oxides. The report identified motor vehicles as the main of urban air pollution in Pakistan and

¹ Per. Comm. Irfan Alrai

² For a comparison of enforcement standards in Asia see e.g. “Reducing Emissions from Motor Vehicles in Asia: A Comprehensive Strategy” Michael Walsh, ADB,

³ These standards are mandated using the idle/3000 rpm test procedure for used vehicles. For new vehicles, manufacturers have to show these standards are met using a dynamometer. The Ringlemann Chart is a crude measurement method for smoke: It measures the degree of blackness of smoke i.e. the soot. It does not measure white smoke or droplets of lubricating oil. It is thus not a very robust method for measuring non-combustion or smoke hazard.

estimated that urban air pollution had resulted in damages worth \$370 Million (1992) with 6.4 million people hospitalized annually for pollution related illnesses. It decried poor enforcement and bad fuel quality as the main causes for the state of air quality in the country.

Despite mixed quantitative evidence and speckled emphasis on air pollution and particularly on the *contribution* of vehicular emissions to air quality, there is strong anecdotal evidence to suggest that air quality is deteriorating and that vehicles contribute significantly to the problem. Experts predict that air pollution will become a significant problem due to increases in population and vehicle fleet sizes. The number of vehicles in Pakistan swelled from 680,000 in 1980 to 4.2 million in 2003 (See Table 2).⁴ It is evident that legislation and enforcement are both required to alleviate the situation.

Table 2: Gasoline/CNG/Diesel Operated Vehicles Population, Pakistan (2002)

Vehicle Type	Population (millions)
Gasoline/CNG Vehicles	3.1
Motor Cycles	1.900
Rickshaws	0.100
M/Cars, Vans, Taxi Cabs, Others	1.100
Diesel Vehicles	1.070
Buses	0.100
Station Wagons	0.090
Trucks	0.170
Tractors	0.600
M/Cars, Taxi Cabs, Jeeps, Delivery Vans, Others	0.110

Source: FERTS 2004

A.4 OVERVIEW OF PROJECT INVESTMENT

Project Name	Fuel Efficiency in the Road Transport Sector
Project Type	Full Sized Project
GEF Implementing Agency (IA)	UNDP
Executing Organisation	ENERCON
GEF Focal Area	Climate Change
Total Cost	\$7.00M (US)
GEF Financing	\$7.00M
Co-Financing	\$0.00 (Government Contribution in-kind equivalent of R. 10.35M)
GEF Operational Programme	OP5 – Energy Efficiency OP11 – Sustainable Transport

A.4.1 Project Objectives

The objective of the Project, as originally envisioned and stated in the Project Document, is:

“The project aims to reduce at source emissions of greenhouse gases and other pollutants by improving fuel efficiency of road transport vehicles in Pakistan. Considerable potential for fuel savings exists as standard of vehicle maintenance is poor, use of fuel efficient technologies is limited, and government policies do not directly address the fuel efficiency and emissions issues. The main objective of the project is to achieve a reduction in carbon emissions in the short-term through the introduction and promotion of state-of-the-art vehicle engine tune-up technologies in the country. Engine tune-up demonstration and training centres, ten for gasoline and five for diesel vehicles, will be established over the country. These centres will help in the development of service sector capabilities in diagnosis of engine performance and will stimulate the market for these services. A revolving loan fund will also be set up to finance the purchase of vehicle tune-up equipment. In addition to the short-term approach of reducing carbon emissions through vehicle engine tune-ups, special studies will be

⁴ See also <http://www.pakistan.gov.pk/environment-division/highlights/highlight-five.jsp>

conducted to support the development of policies and strategies for achieving fuel savings in the long-term. These studies will cover such critical areas as the use of fuel-efficient engines, modal shifts, and alternative fuel technologies. The project will rely primarily on market mechanisms and envisages a pivotal role for the private sector in the achievement of both short and long-term project objectives.”

Thus, the overall **global environmental goal** of the project is to reduce, at source, greenhouse gas emissions and other pollutants by improving the fuel efficiency of road transport vehicles. This is achieved by:

Objective 1: Developing a market for instrumented tune-ups which will be achieved by establishing demonstration tune-up centres:

- Establishing 10 gasoline and 5 diesel tune-up demonstration centres;
- Providing training to mechanics and workshop owners;
- Making road users knowledgeable via public awareness campaigns;
- Strengthening ENERCON.

Objective 2: Establishing a revolving loan fund (RLF) for financing purchases of tune-up equipment by private sector entrepreneurs;

Objective 3: Developing options (policy & legislation) for sustaining fuel efficiency in the road transport sector by producing a number of special studies to identify long-term policy options and alternatives.

The project **development goal** is to reduce dependence on oil imports. Oil imports are a major drain on Pakistan’s foreign currency reserves. The project estimates that improvements in fuel efficiency could save 6% of fuel per annum that would translate into individual and private sector financial savings of “*millions of dollars each year*” (UNDP, 2000 TPR).

The project document identified the following key beneficiaries (or stakeholders):

- Workshop owners (private sector)/mechanics who will benefit from improved technology and increased business opportunities;
- Public/private car vehicle owners/drivers who will reap savings due to reductions in fuel consumption;
- Population at large that will benefit from reduced local air pollution and improvements in health and quality of life in urban areas.

In a stakeholders’ workshop held in October 1998, attended by professionals, policy makers, automobile service engineers and manufacturers, transporters and gas station owners together developed the following **outcome indicators** at the project objectives level:

Environment:

- Percentage reduction in smoke-emitting vehicles;
- Annual reduction in GHG emissions;
- Improvement in ambient air quality.

Human Health:

- Percentage decline of toxic chemicals in the human body;
- Response of citizens towards vehicular pollution related diseases.

Governance/Policy Development:

- Degree of enforcement of vehicle inspection regulations;
- Degree of enforcement of laws to check over-loading practices;
- Number of studies developed into projects or policies.

Poverty alleviation/livelihoods:

- Increase in income of workshop owners/mechanics;
- Savings from reduced fuel consumption for vehicle owners;

Natural resources:

- Fuel savings at the national level from proper tune-up practices and awareness campaigns.

The Project held another stakeholders workshop in 2001 during which stakeholders developed the scope of work for various studies to be conducted by independent consultants. One of the common conclusions of the studies has been that the indicators of Project are very ambitious, and that the project has tried to achieve everything; sometimes-even goals that do lie within its purview, particularly those related to health outcomes.

A.4.2 Project Historical Context

The **initial project concept** for FERTS was developed in the early 1990s by ENERCON as a spin-off from USAID transport sector work. This was subsequently presented to relevant stakeholders and reviewed and approved by GoP, prior to a joint World Bank/UNDP project preparation mission to Pakistan in 1993, during the GEF pilot-phase. The project entered the GEF work program in 1993 and was subsequently approved in 1994. It was signed in Pakistan in May 1996 and implementation began in October 1996. FERTS is the only project in the GEF portfolio that addresses fuel efficiency in the transport sector in urban areas. It is classified under Operational Program (OP) 5 i.e. Energy Efficiency in 1996.⁵

From 1996 to 1999 the project suffered from changes in management and poor stakeholder relations between UNIDO, UNDP and ENERCON and frequent changes in the Project Cycle Operation Manual (PCOM) to be used for national execution of the project. Particularly noteworthy was the inclusion of UNIDO within the committee responsible for the selection of tune-up demonstration centres – UNIDO wanted all procurements of tune-up demonstration equipment to be sub-contracted to it for international procurement and also to be solely responsible for all special studies related to the project. UNDP also supported UNIDO in this context. However, this added significant cost and bureaucracy. For example, tune-up equipment that cost \$7,000 – \$10,000 cost \$15,000 – \$20,000 after all agency costs had been accounted for. MoE and ENERCON refused to procure equipment through UNIDO arguing instead for engaging the private sector directly via competitive tendering. Eventually, UNIDO was removed from the project, and ENERCON, housed within the Ministry of Environment, Local Government and Rural Development was made fully responsible for executing the project (see

⁵ OP11 – Sustainable transport was not developed till 2000.

also UNDP, 1999).⁶ Despite this change, the initial period remained rocky for the project. The **Mid-term Evaluation (MTE) in 1999**, recognized several deficiencies in the project and suggested critical changes in project implementation:

“Only one tune-up centre has been established and none of the special studies completed and no arrangements made with financial institutions for the Revolving Loan Fund ... although some of the initial milestones were extremely optimistic, the project should have been further along at this stage. Delays during the first year may have been due to frequent changes of leadership of ENERCON ... A major factor that adversely affected the progress of the project was the manifestation of mistrust, miscommunication and misunderstanding which led to a strained relationship between the National Project Director and some senior staff in UNDP.” (UNDP, 1999)

The MTE (1999) recommended re-organizing project management to improve implementation. It also recommended greater emphasis on setting up tune-up demonstration centres, policymaking and advocacy, and gender. As a consequence of these recommendations, the post of the national project director, which had been lying vacant for a while, was immediately filled. Under its new leadership, FERTS has made considerable progress in establishing good working relations with UNDP, GoP and, critically, the private sector. This resulted in a revised rating of the project, from ‘unsatisfactory’ in 1999 to ‘satisfactory’ in 2004. As of May 2004 the project had set up 27 tune-up demonstration centres (nearly double the initial target of 15 centres), had commissioned and/or completed 18 special studies to feed into GoP policy/legislative development, developed and implemented public awareness campaigns in all major cities of Pakistan, and trained workshop owners/mechanics in operating instrumented tune-up technology (See Box 1).

⁶ Dr. Sarwar Saqib pers comm.

Box 1: What are ‘Tune-ups’? Why Instrumented Tune-ups?

Vehicle tune-ups as the name suggests, examine if engines are operating at their most efficient. This is judged by examining the engine and its emissions, when it is idling and while it is running. Typically, **computerized/instrumented vehicle tune-ups** consist of two parts:

The first part of an instrumented tune-up analyzes emissions using a gas analyzer. Gas analyzers analyze the amount of carbon dioxide, carbon monoxide, particulate matter, hydrocarbons, oxides of sulphur and oxides of nitrogen. Gas analyzers in Pakistan usually analyze three gases although recently five gas analyzers have also started to be used.

The second part of an instrumented tune-up uses a combination of machines to analyze the performance of the engine. This tune-up equipment may also contain other elements such as tuning the air-conditioning system (an R-12 machine for a CFC air-conditioning systems and R134a for a non-CFC air conditioning system). Other engine analysis equipment consists of a fuel cleanser, a chassis dynamometer, an injector cleaner and tester, an auto transmission fuel changer, an engine multi-analyzer and an engine scanner. Computerized/instrumented tune-ups can be used for all types of engines: gasoline, diesel or CNG. Irrespective of fuel type, all EFI engine systems can only be tuned using instrumented tune-up equipment. They cannot be tuned manually.

Manual tune-ups involve veteran mechanics listening to e.g. the sound of the engine, or looking at the colour of smoke to diagnose a problem with the engine. Engine tuning skills are typically passed down from master to apprentice and are not very precise. Thus customers would get their vehicles manually tuned only when it was apparent that there was something wrong with the engine. Because manual tune-ups do not use any widely accepted standards, typically the mechanic tunes the vehicle to the manufacturer’s specifications, irrespective of the age of the vehicle. Manual tuning also makes it very difficult to adhere to emission legislation and fuel standards since measurements are never made scientifically.

In Pakistan the **experience** of a manual tune-up is also different from an instrumented tune-up. Instrumented tune-ups are usually done in relatively big workshops. Owners/drivers are seated in clean rooms with e.g. air conditioning and glass doors through which they can see mechanics working on their car. Drivers and car owners are also provided with computer read-outs and comparisons with earlier records. Frequently these services come ‘bundled’ with other services: tune-up centres have diagnostic capabilities and provide other services such as car washes, a facility to change parts and a complimentary oil change.

Source: Local Benefits Study Team Field Consultations, Pakistan 2004 and UNDP/FERTS documents.

A.5 Status and Outcomes of FERTS

This section reports FERTS’ achievements by objective and is based on data collected during the study team field mission (May, 2004) and from project documents (e.g. PIR 2003, 2004). Under each objective, the activities, targets, achievements and an assessment of the objectives/achievements is presented. The study team also presents its conclusions at the end of its discussion on each objective. These conclusions provide the basis for its conclusions and recommendations in later chapters. Since this is not a project ‘evaluation’, the conclusions represent a study of the repercussions of the targets and achievements and discuss their relevance to the *mandate of the study team*.

Objective 1: Developing a market for instrumented tune-ups, which will be achieved by establishing demonstration tune-up centres.

Activity: Establish 10 gasoline and 5 diesel tune-up demonstration centres (Revised target: 30 tune-up demonstration Centres)⁷

- Twenty-seven tune-up centres have been established (19 Gasoline and 8 Diesel):
- An average of 9 tune-ups per day of gasoline vehicles and 5 tune-ups per day for diesel vehicles per demonstration centre has been recorded. The maximum number of vehicles tuned in one day is 35, as reported by a tune-up station in Karachi. (Target: 20 gasoline engine tune-ups/12 diesel engine tune-ups per day);
- There is one instrumented tune-up facility per 12,700 four-wheel vehicles, including instrumented tune-up facilities established in the private sector attributed to spin offs from FERTS.⁸ (Target: One tune-up centre for every 15,00 four-wheel gasoline/diesel vehicles);
- The project is currently in the process of procuring 23 additional sets of tune-up equipment to reach its revised targets for establishing demonstration tune-up centres. Seven tune-up centres are now completely owned by participating site owners after receiving the cost of equipment (PIR, 2003).

The project has brought about significant participation from the private sector and other organizations for promoting instrumented tune-ups. These actors are: Pakistan EPA, WWF, ARUP, PSO and the private sector which mostly include retail outlets of oil distributing companies such as CALTEX and Shell, and, CNG filling stations. The list also includes individual workshop owners and vehicle manufacturers such as Toyota Southern Motors (Karachi), Suzuki Azim Motors (Islamabad) and Suzuki Motorcycles (Karachi). The project has also established a vehicles' emissions testing station (VETS) and mobile vehicle testing facility (MVET) in Peshawar.

Activity: Provide training to mechanics and workshop owners

The project has initiated two types of training workshops:

- A free two-day training workshop that addresses the concerns of potential entrepreneurs who aim to set up tune-up centres of their own. These workshops focus on equipment specifications and requirements, address financial feasibility concerns (and teach participants how to do a feasibility report), and informs participants about minimum requirements for setting up a tune-up centre;
- A free three-week training workshop on the use of equipment, including a general refresher course in the use and design of engines and electronically fuel injected engines (EFIs) and diagnostics. Class sizes are approximately 20 people. These workshops are sub-contracted out and are hosted by training centres and polytechnics.⁹

The project has exceeded its targets in achieving this objective. So far, 1,567 mechanics have received formal training conducted in major cities of the country such as Karachi, Islamabad-Rawalpindi, Lahore, Quetta and Peshawar. (Target: 1200 mechanics and 821 workshop owners). FERTS has also established links with training institutes in 10 cities to outsource capacity building in the private sector e.g. The project has built important links with Fikri Automobile training Institute (Karachi).¹⁰

However training needs to be followed-up with available financing so that workshop owners can have opportunities to invest in tune-up equipment (putting what they have learnt into practice). The project has not been able to deliver on this objective because of the delay in setting up the RLF, causes for which have been mostly outside the control of ENERCON.

⁷ The first and second revisions of the objectives, recommended setting up 30 and 50 tune up centres respectively.

⁸ This is controversial. Although the project reports (in its PIR) that there is one instrumented tune-up facility for every 12,700 vehicles, SEBCON (March 2002), and independent consulting firm reports that this figure is lower – that there is one instrumented tune-up facility for every 23,000 vehicles.

⁹ For example, the National Institute of Science and Technical Education (NISTE) in Islamabad is one such institute. NISTE, like other training institutes, is paid for its services and provided with teaching materials and uniforms, by the project. NISTE initiated the first training course for ENERCON. 10 other institutions are involved in 10 cities of Pakistan.

¹⁰ www.cyberbridge.com.pk/mesec/training.html

Activity: Public Awareness campaigns among road users

- More than 70 advertisements have been placed in the national press regarding project activities, its tune-up centres, free tune-up camps, training programs, etc. Two thousand copies each of 11 brochures/energy tips have been printed and distributed;

FERTS has established strong institutional links with several civil society organizations. These include Association of Road Users of Pakistan (ARUP), Pakistan State Oil (PSO) and World Wildlife Fund (WWF) for developing and implementing public outreach. PSO, which is a major partner of the project in setting up tune-up demonstration centres at its retail outlets, launched a huge countrywide mass awareness campaign in 2003-4, to communicate the importance of environmental protection and pollution abatement from road transport vehicles.

Activity: Strengthen ENERCON

The target of the project is to develop ENERCON's capacity and build links with NGOs, GoP etc. ENERCON has developed an information database, library and website to reach this target.¹¹ As part of it awareness creation campaign, ENERCON personnel have been trained in newsletter publishing and launching nationwide awareness campaigns, which have been put to use on several occasions. It attests to perceptions regarding ENERCON in the government that MoE has devolved more responsibility to ENERCON in areas of fuel efficiency and energy. ENERCON has also established new relationships with, and strengthened links with GoP, the private sector and NGOs through seminars, dissemination workshops:¹²

- FERTS has worked closely with the National Highways Authority (NHA) to conduct workshops for the public throughout Pakistan on road safety and fuel efficiency;
- ENERCON has continued to strengthen relationships with private sector such as oil distributors, vehicle manufacturers/retailers and workshop owners;
- ENERCON has established joint links with ARUP and WWF for public awareness campaigns (particularly on World Environment Day);

Conclusions

The project has made significant advances in strengthening the supply side of the market. This is evident in the tune-up services sector where they have met or exceeded their targets in training, building linkages with the private sector and creating awareness. Admittedly this has also been bolstered by the relatively recent entrance of EFI system vehicles that cannot be manually tuned – the popular back-stop measure. The project has also done well at strengthening ENERCON'S institutional capacity and this has positive implications for post-project sustainability.

However the project falls short on providing the adequate 'demand side push' i.e. in creating awareness among vehicle users and operators regarding the value of instrumented tune-ups vis-à-vis manual tune-ups. This deficiency cannot be accorded to price sensitivity: despite its skill and automation, both types of tune-ups are priced similarly and instrumented tune-ups lead to greater fuel savings. Unless demand for instrumented tune-ups increases, tune-up centers/workshops will not be able to meet costs of procuring tune-up equipment and the project may not be able to deliver its global environmental objective of reducing fuel consumption and significantly reducing GHG emissions via extensive market transformation.

Objective 2: Provide Financing for the Purchase of Tune-Ups Equipment (Revolving Loan Fund).

The ECF (Energy Conservation Fund), a company limited by guarantee for operating the revolving loan fund (RLF) was established in 2002. The main objective of the ECF is to provide technical support, expertise and finances to the public and private sector for energy conservation activities. The RLF will specifically focus on providing loans for tune-up equipment. As of April 2004, proposals from banks and leasing companies interested in disbursing RLF loans to workshop owners and to me-

¹¹ Website is updated regularly, see www.enercon.gov.pk

¹² 1,150 policy makers and professionals have participated in seminars and workshops

chanics for setting up instrumented tune-up facilities had been solicited and four such vendors had responded.¹³ Three have been short-listed and it is anticipated that the RLF will be operational by October 2004. (Target: RLF operational by 2001 and disbursing loans by 2002).

An ENERCON survey indicated that more than 227 private sector workshops have invested in instrumented tune-up equipment and are operating successfully as a result of the project 'demonstration effect' (PIR 2003). Over 100 workshop owners have expressed interest in tune-up equipment and RLF financing

Conclusions

The sustainability of project impacts and success in achieving its global environmental goals is predicated on the RLF being operational. Currently there are no stand-alone tune-up centres, which indicates (as was also verified by numerous interviews), that instrumented tune-up centres are not a viable stand-alone economic activity. Thus instrumented tune-ups are presently only operated by workshops and private vendors who have pre-existing workshops that provide a large menu of services to vehicle owners and are keen to expand the list to become more attractive. Thus tune-up centres are usually housed within large workshops that have other means of subsidizing the capital cost of tune-up equipment. For instrumented tune-up centres to reach less well-off operators and/or be a viable stand-alone economic activity, it is critical that the RLF be made operational soon. As of May 2004 the RLF was still not operational and US\$3.1 Million remained un-disbursed in project funds. This delay in setting up the RLF (attributed to overly-bureaucratic processes) is a major weakness in project implementation and may reduce the project environmental and development impact. It is also likely that FERTS will risk losing a lot of its goodwill and reputation, created over time among workshop owners, if the RLF is not made operational soon.

Objective 3: Development of options for sustaining fuel efficiency in the road transport sector.

The project is targeted to sponsor fifteen studies related to fuel efficiency in the road transport sector, all of which have either been completed or are underway (See Annex 3 for details). It was envisioned that these would provide a baseline for the state of transport sector and help to inform policy. There is some evidence of this: The FERTS project study of Motor Vehicle Examiners office (MVE) has resulted in the Japanese International Cooperation Agency (JICA) agreeing to fund a model MVE facility in Islamabad-Rawalpindi.

Conclusions

These studies are one of the strengths of FERTS. In an area that has been historically handicapped by lack of data and evidence, FERTS has succeeded in building a participatory and consensus driven process and sponsored relevant studies, critical to developing policy in the transport/environment nexus. There are many indications that relevant GoP officers acknowledge and recognize the value of these studies.

Nonetheless, although the project has built many significant relationships with the private sector, it has not capitalized on its relationships within GoP. The policy-making 'influence' of FERTS studies on GoP, catalyzing emissions related legislation, remains to be fully realized. There are only modest indications that the project intends to take the next step and focus on policy dialogue/advocacy in the last 18 months of implementation. Unless the project makes a concerted effort to synthesize conclusions of its various reports and build widespread support for their recommendations in government, in the private sector and civil society, there is a danger that relevant stakeholders, specially GoP, will perceive these as too disparate to induce policy and legislative changes.

¹³ The Revolving fund is the first of its kind in Pakistan. The three million dollar revolving fund will provide lending to auto-mechanics and workshop owners who undertake activities (*buy down the initial cost of the equipment*) that lead to improved fuel efficiency in the transport sector in Pakistan

A.6 NATIONAL AND DONOR STRATEGY

In 1992, the **Pakistan National Conservation Strategy** (NCS) stipulated three goals for the country's environmental protection efforts: (1) Conservation of natural resources; (2) Promotion of sustainable development; and (3) Improvement of efficiency in the use and management of resources. Fourteen program areas were targeted for priority implementation, including energy efficiency improvements, renewable resource development/deployment, pollution prevention/reduction, urban waste management, institutional support of common resources, and integration of population and environmental programs. The FERTS project is in compliance with several program areas.

The FERTS project is also congruent with the 5th **UNDP Country Program** (1996) that emphasized “support to the management of the environment and natural resources in accordance with GoP National Conservation Strategy”. Specifically, UNDP focused on natural resource management and energy efficiency improvements, of which FERTS represented the latter. The MTE for 5th UNDP Country Program resulted in its revision and the development of the “Country Cooperation Framework (CCF)” (1998 – 2003). The CCF emphasizes three strategic objectives that are relevant to FERTS:

Governance A priority of the GoP is creating an enabling environment within which the people of Pakistan can influence the direction and conduct of their governing institutions. The UNDP program seeks to strengthen Pakistan’s capacity in democratic processes, policy development, development management, civil society and public-private linkages. FERTS’ objective of building environmental and transportation policy and legislation links with this strategic objective;

Gender GoP firmly believes in the need to advance the cause of women and therefore adopted the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW). UNDP is assisting in preparing a national programme for the implementation of CEDAW. FERTS’ MTE (1999) also emphasized gender issues and increasing sensitivity towards women drivers in a largely male-dominated sector. In this regard, FERTS is not only ensuring that tune-up training is gender sensitive but also provided special discounts to women drivers bringing their vehicles into tune up centres (PIR, 2002);

Sustainable Livelihoods The issue of poverty and the environment is addressed in Pakistan at two levels: (a) interventions that address the poverty/environment nexus in a given geographical area of Pakistan, defined principally by the needs of the local community, especially its disadvantaged members; and (b) interventions that address global environmental concerns in the context of Pakistan. UNDP efforts will be directed to adding the human dimension to environmental issues, and in contributing to Pakistan’s technical capacity. It is foreseen that FERTS, by training mechanics will build employment options for the urban population while increasing their awareness on air quality issues. The sustainable livelihoods objective specifically focuses on GEF interventions:

“Sustainable Livelihoods Programme will also provide the framework within which resources such as the Multilateral Fund of the Montreal Protocol and the Global Environmental Facility will continue to be mobilized for Pakistan. This will build on an already quite successful range of activities funded from these sources, in areas such as biodiversity and vehicular pollution [FERTS].”

B. LOCAL BENEFITS

This section describes the study team's findings regarding the project's impact on local livelihood capitals. The study team used the **Livelihoods Assessment Framework** (LAF) as the principal means of assessing these livelihood impacts, gathering information through fieldwork and stakeholder consultations (see Annex 5).

The LAF was segmented according to the broader GEF Benefits Study's generic categories and concentrated on the capitals below¹⁴:

- ▶ Increased livelihood opportunities, **income and financial capital**, including increases to the productivity of existing and opportunities for new livelihood activities, increases in cash income and improvements to the ability to save or availability of capital;
- ▶ Improved **social capital**, equity and institutional capacities in local communities, including the enhancement of community-level institutional capacities and contact networks and the improved ability in local communities to deal with outside agencies. It also includes improvements to gender and social equity at the local level, especially through the empowerment of women and minority groups in decision-making.
- ▶ Improvements to **physical capital**, including investments in tools and machinery, access to or the ownership of land and buildings and access to infrastructure such as transport, telecommunications or water supply and irrigation.
- ▶ Improvements to **human capital**: the skills, knowledge, work ability and management capabilities of local community members. There is typically a need for a gender focus in this that emphasises issues such as functional literacy and management skills of women.
- ▶ Improvements to **natural capital** including improvement in air quality, surface and ground water, and environmental services such as safe waste disposal.

In the next section, local benefits *intended* by the project as laid out in project documents, are discussed. In section B.2 we *discuss intended and unintended impacts* of the project, on the capitals above.

B.1 INTENDED LOCAL BENEFITS

Intended local benefits from instrumented tune-up technology as stated in the project document are:

- **Income savings** to individual vehicles owners (for gasoline vehicles) estimated to be Pak Rs. 5,832 per year (approximately US\$80)¹⁵;
- **Income earnings** (gross profits) to workshop owners (for gasoline vehicles) estimated to be Pk Rs 314,100 per year (approximately US\$4,188)¹⁶;

¹⁴ See Annex 1 and Figure 1 for full details.

¹⁵ Based on 56,500 km/year; price of fuel per litre 6.40 Rs/lit (1996 prices); fuel cost per year 97,204 Rs /yr; savings 6% of fuel costs – 5,832 Rs (based on the Prodoc p. 21)

¹⁶ Based on investment of Rs 600,600; maintenance costs of 90,900 Rs per /yr and 4,500 tune-ups per / yr generating additional revenue of 405,000 per /yr. Does not include additional business generated from diagnostic use of equipment (based on the Prodoc p.21).

- **Income earnings** (gross profits) to workshop owners (diesel vehicles) estimated to be Pk Rs 961,200 per year (approximately US\$12,816)¹⁷;
- **General public health** will be improved through reduction in local air pollution from improvements in fuel efficiency and policy/legislation to control pollution.
 - General public will become more aware of the need for fuel efficiency and energy conservation and change behaviour

B.2 REALIZED LOCAL IMPACTS

In this section, we examine the impact of FERTS on livelihood capitals. The project shows progress in developing financial, social and human capital, albeit with important exceptions. It is impossible to judge achievements made in natural capital.

B.2.1 Financial Capital

The project is expected to impact financial capital for two groups of stakeholders: Workshop owners and vehicle owners (both individuals and fleet owners).

Impacts on Workshop Owners

Ex ante it is expected that workshop owners will benefit from installing tune-up equipment in their workshops. However this is not always true. We discuss impacts on workshop owners under two headings: i) Impacts of installing tune-up equipment on revenues of workshop owners; ii) Impact of the Revolving Loan Fund (RLF) on various stakeholders.

The study team divided financial gains for workshop owners from installing tune-up equipment, into two: The first is direct financial gains such as increase in profits for owners. The second is indirect financial gains because of increased attractiveness of services for customers leading to increased satisfaction, more repeat customers and less uncertainty. Our main conclusions about gains for workshop owners from installing tune-up equipment in workshops are:

- In the short to medium term (1 – 10 years) direct financial gains are insignificant;
- In the long term (more than 10 years) direct financial gains are significant;
- In the short to long term (More than 1 year) indirect financial capital is significant;

The team found that **direct financial (income) benefits** from installing instrumented tune-up systems were unlikely to be significant in the short to medium term (1 to 5 years). Interviews with private sector stakeholders notably Toyota Southern Motors (Karachi) and Suzuki Motors (Islamabad) revealed that they predicted “breakeven in 10 years” after installing tune-up equipment (see Box 1). (Tune-up equipment costs an average of US\$7,000 – 10,000. Other costs include maintenance and costs of operation. Every tune-up costs the customer approximately Pk Rs. 200 – 300 (approx. US\$3.75–5.5). Tune-up centres get an average of seven customers per day which means revenue per day equal to US\$26.25 – 38.5.)¹⁸ Table 3 below shows the number of vehicles and revenue for the tune-up centre at Toyota Southern Motors

¹⁷ Based on 2,700 tune-ups per /yr generating additional revenues of 1,417,500 Rs per /yr and incurring maintenance costs of 456,300 Rs per /yr (based on the Prodoc p.21 – 22).

¹⁸ Based on discussions with TSM and SM Islamabad.

Table 3: Tune-Up Sales and Revenues from Toyota Southern Motors, Karachi, Pakistan, 2002-4

Time	Apr – June 02	Jul – Sept 02	Oct – Dec 02	Jan – Mar 03	Apr – Jun 03	Jul – Sep 03	Oct – Dec 03	Jan – Mar 04	Total
Number of Ve- hicles tuned	544	688	565	681	640	767	780	842	5,507
Revenues (in US\$ equiva- lent) ¹⁹	2,764	3331	2765	3274	3193	3750	3638	4052	26945

(Source: Toyota Southern Motors, Karachi, Pakistan, 2004)

Toyota Southern Motors reported that there were significant **indirect impacts on income** because instrumented tune-up equipment is used to identify other mechanical problems which customers are advised to correct, leading to improved sales of components and services. Instrumented tune-ups also build greater trust (see Section B2.2) between the workshop and its customers because computerized read-outs instil confidence and certainty in additional recommendations for work. This leads to improved customer loyalty and repeat business. The Director of Toyota Southern Motors told the study team that:

“The equipment is not making a profit as a stand alone item, but it is useful in terms of identifying other problems with the engine and generating follow-on work for the mechanics workshop. I think it also gives the customer a level of confidence in our recommendations for other work and so we have also got repeat business.” (Toyota Southern Motors, Karachi)

It is expected that **financial gains in the long run** from installing tune-up equipment will be robust. This is because the national fleet of EFI vehicles, which can only be tuned, using computerized/instrumented tune-up equipment, is likely to grow rapidly.²⁰ This is likely to result in a significant improvement in the stand-alone profitability of tune-up equipment and encourage private sector investments. Presently there are no stand-alone instrumented tune-up centres in Pakistan.

In order to deal with the foreseen inability of the private sector to purchase expensive tune-up equipment, the Ministry of Environment (MoE) set up the Energy Conservation Fund (ECF) in 2002. The Fund is limited by guarantee. The main objective of the Fund is to provide technical support, expertise and finances to public and private sector for energy conservation activities (See Box 2).

The average workshop owner in Pakistan usually does not have easy and cheap access to capital. Many stakeholders told the study team that they would have to pay interest rates of more than 14% to get a loan for purchasing tune-up equipment, if at all. The RLF alleviates this market imperfection by providing subsidized capital to workshop owners. It is expected that easy availability of capital will increase the adoption of advanced engine diagnostic technologies. In field interviews, workshop owners across income classes expressed a great desire to get financing from the RLF.

¹⁹ Variations in monthly revenues (although higher reported vehicle tune-ups) are caused by differences in the types of tune-ups provided and cost differences.

²⁰ ‘Computerized’ and ‘Instrumented’ are used inter-changeably in the study report.

Box 2: The Energy Conservation Fund (ECF)

The goal of the ECF is *“To sponsor, promote and provide assistance to private and public organizations involved in energy conservation activities”*.

The ECF is responsible for selecting vendors, mainly financial institutions (FIs), for disbursing funds from the US\$3.1 Million RLF set up under the aegis of FERTS. The ECF charter also contains provisions for other donors interested in sponsoring energy conservation activities in Pakistan.

At the time of the study mission (May, 2004), ECF had held six meetings of its Board of Directors and two Annual General Body Meetings. The Fund had also finalized its positive list of items eligible for loans and selection criteria for choosing FIs had been approved and standardized. In February 2004, the Fund had widely circulated an RFP in the national press and had received expressions of interest from five FIs (four leasing companies and one bank). Four of these FIs have been short-listed since. Board members (the ECF Board consists of 9 directors representing UNDP, Government of Pakistan and private sector professionals/stakeholders) contended that the selection of FIs would be finalized in the next board meeting and, in the absence of a quorum (as had occurred in a previous meeting), would be resolved by circulation. Lending is expected to start by October 2004.

Standardized conditions for providing loans for procurement/purchase to dealerships and vendors include:

- a. An interest of 9-10% p.a. is charged on the loan. Of this 4% is charged (and kept) by the FIs and 5% is remitted to the ECF. Management and administrative costs of the ECF are 0.5-1% p.a.;
- b. A down payment of 10% or more of the cost of the machinery is required from the purchaser;
- c. The vendor (FI) has to disburse Pk. Rs 50 Million within a year of getting the money. If funds are disbursed faster, another tranche can be provided by ECF. If it is not disbursed, ECF reserves the right to take the monies back.

Repayment periods are expected to be 3-5 years depending on the size of the loan.

The three million dollar RLF will provide funds at subsidized rates to auto-mechanics and workshop owners who wish to install instrumented tune-up equipment. The main objective of the RLF is to facilitate the market development for instrumented tune-ups. The RLF is the first of its kind in the country.

However till the RLF is made operational, the overall impact of the tune-up centres and of FERTS on average vehicle condition, air quality and cumulative fuel savings, will remain modest because large capital investments are required to set up computerized tune-up centres and few can afford to undertake this venture without being subsidized. A trainee that the team interviewed, stated: “...tune-up equipment is expensive ... from where am I going to recover the cost?” Few mechanics/workshops have the financial wherewithal to either put up the capital to buy computerized equipment or to wait out the long gestation period after which the investment starts to evince returns.

Impacts on Vehicle Owners

It is hypothesized that vehicle owners gain from instrumented tune-ups because of savings in fuel and benefits from equipment maintenance ensuring the vehicle’s longer life. The team concluded that:

- In the short to long term (after one year) direct financial gains to vehicle owners are likely to be significant;
- In the short to long term (after one year) indirect financial capital is likely to be significant.

The team was not able to directly assess impacts on vehicle owners through primary data collection, but relied on data provided by FERTS (see Table 4)²¹. The table shows that savings from computer-

²¹ Average annual savings to vehicles owners range between US\$47 – 206 . Based on communications with project staff. Cost of two tune ups per year is approximately US\$10, therefore pay back for gasoline vehicles is approximately 3 – 4 month.

ized tune-ups can be considerable, especially for diesel engines. It is important to note that the impact of computerized tune-ups can vary and their impact on fuel consumption depends on many factors such as fuel type, age and condition of the engine, engine work-rate and driving conditions etc.

Table 4: Individual Fuel Savings for Gasoline and Diesel Vehicle Owners

	Gasoline Vehicles	Diesel Vehicles
Total number tuned per year	133,258	11,810
Total fuel savings (US\$)	6.605M	2.443M
Average fuel savings per vehicle (US\$)	49.56	206.85

Source: FERTS, 2003

In another study, records of gasoline vehicle tune-ups were used to assess the impact of computerized tune-ups (SEBCON, 2002). Five hundred tune-up records were randomly selected. More than one-third of these were 1300 cc engines, one-fourth were 1000 cc engines, one-fourth were 800 cc engine and the others were engines of capacities ranging from 1100cc to 1500 cc. Data indicates that 71% of all gasoline vehicles tuned showed improvements in fuel efficiency although most of these improvements in efficiency occurred in vehicles using a *rich* fuel mixture before tune-up (See Table 5). Vehicles using a *lean* fuel mixture showed lesser improvements in efficiency: Only 32% of vehicles using a lean fuel mixture showed an improvement in efficiency. The study used the volumetric percentage of carbon monoxide in emissions as the main indicator for assessing the combustion efficiency of fuel. (A higher concentration of carbon monoxide means a lower efficiency and vice versa) SEBCON also undertook a similar study to examine impact of tune-ups on commercial diesel powered vehicles. Data is still being analyzed and the final results are expected soon (see Box 4).

Table 5: Impact of Tune-ups on Vehicle Efficiency

Vehicles with rich mixture before tune-up	61%
Vehicles with lean mixture before tune-up	39%
Total	100%
Vehicles showing efficiency improvement after tune-up	71%
Vehicle showing no efficiency improvement after tune-up	29%
Total	100%
Vehicle with rich mixture before tune-up	
Vehicles showing efficiency improvement after tune-up	94%
Vehicles showing no efficiency improvement after tune-up	6%
Vehicles with lean-mixture before tune-up	
Vehicles showing efficiency improvement after tune-up	32%
Vehicles showing no efficiency improvement after tune-up	68%

Source: SEBCON, April 2002.

When a similar experiment was undertaken at the Vehicles Emission Testing Service (VETS) in Peshawar, it was estimated that savings to gasoline vehicle owners was approximately Pak Rs. 240 Million and savings to diesel vehicle owners was Pak Rs. 51 Million (at a cost of Pak Rs. 32/liter of gasoline and Pak Rs. 15/liter of diesel).

ENERCON estimates that the country has saved approximately 115,000 tonnes of gasoline and approximately 835,000 tonnes of diesel from computerized tune-ups, leading to savings equal to \$0.2 Million (in 2003). However there is no data to compare these savings with those from *manual* tune-ups, the backstop in a lot of cases. It would also be relevant to compare these savings with those from other measures such as unleaded gasoline and sulphur free fuel, which result in increased fuel efficiency.

Box 3: Study on Fuel Efficiency in the Commercial Vehicles Sector (commissioned by FERTS, undertaken by MASCON)

The objective of the study is to examine the impact of age of vehicle, quality of maintenance, road conditions, fuel quality and driving habits on emissions and fuel efficiency. It also assesses the current level of fuel efficiency in diesel powered commercial transport vehicles.

Methodology The study was conducted in two phases. In Phase I, trials were done after diesel vehicles had travelled 2000 km (vehicles were examined in an as is/where is condition) before and after a tune-up. In Phase II, vehicle efficiencies and characteristics were studied after the tuned vehicles (tune-ups done at the end of Phase I) had travelled 1000 kms. All participants were paid by ENERCON.

Selection of vehicles Two hundred 'sound' diesel powered vehicles were selected for the study. There included 150 inter-city trucks and 50 intra-city sixteen-seater wagons. Vehicles were selected on the basis of their makes/types, vintage, maintenance states, and routes taken by the vehicles, road conditions and topography. Vehicle observers, who went along with the trucks, were selected on the basis of their education. After completing the first run of 2000 kms (in Phase I) instrumented tune-ups checked for oil quality, fuel filters, brakes, tire inflation, radiator cleaning other than regular engine diagnostics etc. Vehicle exhaust emissions were analyzed using a portable opacity meter, before and after the tune-up i.e. at the end of phase I and at the beginning of Phase II. Vehicles from three manufactures were observed (Toyota, Mazda and Ford) in five cities (Karachi, Lahore, Faislabad, Rawalpindi and Peshawar). (One interesting finding was that a lot of Ford wagons, almost all driven in Peshawar, used 'Kabuli spares' – spares made in Afghanistan and illegally imported across the border.)

Questionnaire The questionnaire administered to the drivers consisted of the following questions: Maintenance records, trip sheets, loading records, tyre records, data on fuel (replenishing frequency), fuel samples, vehicle tune-up records; driver habits (age, experience, education, helper), observations on transporters/owners and their perceptions.

Results The study concludes that diesel powered commercial vehicles are characterized by low efficiency, frequent use of fuel contaminants leading to poor fuel quality and high levels of unburnt fuel and inefficiency. They also find that vehicles are usually inadequately maintained and this is exacerbated by poor road conditions. Drivers of vehicles are frequently illiterate and poor. The study found that newer vehicles are usually employed on inter-city routes and not within urban areas, which are not very profitable. Thus most vehicles plying within urban areas are very old and are very polluting. The study also finds, as is suggested by intuition, that maintenance of older vehicles led to greater fuel savings compared to maintenance in newer vehicles.

Critique The study is very large and has collected an unprecedented amount of information about the commercial sector. However its conclusions are rather premature. Many of the conclusions are drawn from partial correlation analyses that does not control for other factors (also called shared causality) or correlation between independent variables. The study also makes several recommendations, which address some of their findings, but does not present practical methods. For example, it recommends that transporters use newer vehicles in inner city routes. But it does not suggest an incentive structure to bring about this change: Truck owners are loathe to operate new trucks on congested and short inner city routes because of large operational costs and low returns.

Source: Presentation by MASCON and Local Benefits Team analysis, Pakistan, 2004.

B.2.2 Social and Institutional Capital

The team assessed the impact of FERTS to social and institutional capital by examining the impact of the project on legislation and institutional strengthening, building capacities for networking, empowering women and incorporating equity.

Contribution to Legislation and Institutional Strengthening

The most significant bottleneck in reducing emissions in Pakistan is the absence of legislation in the area of emission standards and poor enforcement of standards/guidelines. FERTS tries to redress this by i) undertaking several studies on emissions and factors impacting emissions and ii) assessing capacities of the Motor Vehicle Examiner's office which is responsible for examining the state of commercial vehicles on road.²² These studies have made **many useful recommendations**. These include: Setting separate emission standards for in-use and new vehicles and for gases other than carbon monoxide. These include standards for hydrocarbons, carbon dioxide, NOx and SOx;

- Creating and enforcing fuel quality standards;
- Defining the role of the MVE clearly, especially in relation to the federal EPAs and EPDs and providing it with more funds to ensure better enforcement of emission standards and vehicle efficiency standards;
- Institutionalizing driver training for converting gasoline and diesel engines to CNG engines;
- Establishing the RLF as soon as possible to widely disseminate instrumented diagnostic and tune-up facilities in the country.

Building Networks and Trust

Training courses sponsored by FERTS have allowed workshop owners/mechanics to learn from each other and network informally. In focus groups conducted by the study team, mechanics underlined the air of cooperation that frequent meetings had helped build. Instrumented tune-ups also inspire trust in customers since they are less at the mercy of the mechanics' interpretations, can see print-outs of emissions and fuel combustion, and can instantly compare 'before tune-up' and 'after tune-up' scenarios. Finally, almost all training centres provide certificates of completion to their trainee mechanics. This helps to boost customer confidence and build trust in the ability of the mechanic (even though many workshop owners have not yet installed instrumented tune-up equipment). Many mechanics interviewed during the study mentioned in a 30–35% increase in repeat business. A mechanic in Islamabad noted, "Reputation has increased by-word-of-mouth."

Empowering Women and Minority Groups

The transport sector in Pakistan is male dominated. Men usually work long hours as mechanics, drivers and workshop owners. Women do not usually take these roles because it is not considered appropriate for them to contact men outside family networks. However as Pakistan develops, more women have started to drive cars.

Following the MTE (1999), which emphasized the importance of gender sensitivity, FERTS started to make a concerted effort to make tune-up training gender sensitive so mechanics would treat women drivers with respect. The project also made efforts to solicit participation from women workshop owners. It provided initial discounts to women to take their cars for tune-ups and encouraged women workshop owners/entrepreneurs to host tune-up centres within their garages. There are at least a couple of tune-up demonstration centres that are run by women in Islamabad. The study team also met two women who were attending a six-week long training workshop at the Fikri Automobile Training Institute (FATI) in Karachi. They were attending the course along with 24 other male mechanics to better understand vehicle mechanics. However it is unlikely that the project will be able to alter cultural attitudes in a significant way.

²² See Annex 2 and Annex 4 for a list of FERTS' studies.

Equity Issues

Wealthy workshop owners have set up most tune-up demonstration centres. Data collected by the team and direct observation of private sector participants revealed that most participating workshop owners have significant collateral, are well connected and have a reputation in the market. They decide to participate in the project and host tune-up centres in their DODO (dealer owned dealer operated) workshops because they want to provide ‘other’ services to their customers.

It is not clear that the project will be able to go beyond these ‘champions’ and reach the small and medium sized enterprise owner who wants to set up a tune-up centre within his workshop. Although it is usual that leaders of society are selected in the initial stages of a demonstration project, so others can ‘imitate’, the project has not been successful in making it easy for the average entrepreneur to buy and set up tune-up equipment. This is critical if the project is to have the widespread impact on air quality and vehicular emissions it aims at.

B.2.3 Natural Capital

The team assessed the impact of FERTS on natural capital by examining the impacts of instrumented tune-ups on air quality. Although it is clear that instrumented tune-ups reduce vehicular emissions, there remain several sources of ambiguity. We provide a brief overview here before assessing the impact of the project on air quality.

There is no standard monitoring or reporting format for ambient air quality in Pakistan. Different public and private sector organizations undertake studies to monitor different ambient pollutant levels, the data are patchy and discontinuous at best, and are not widely disseminated. Some estimates of emissions, produced from 1,000 tonnes of gasoline and diesel fuels are presented below (Table 6). The table shows that controlling exhaust emissions from diesel vehicles has a much larger impact on reducing pollutants than controlling emissions from gasoline vehicles.

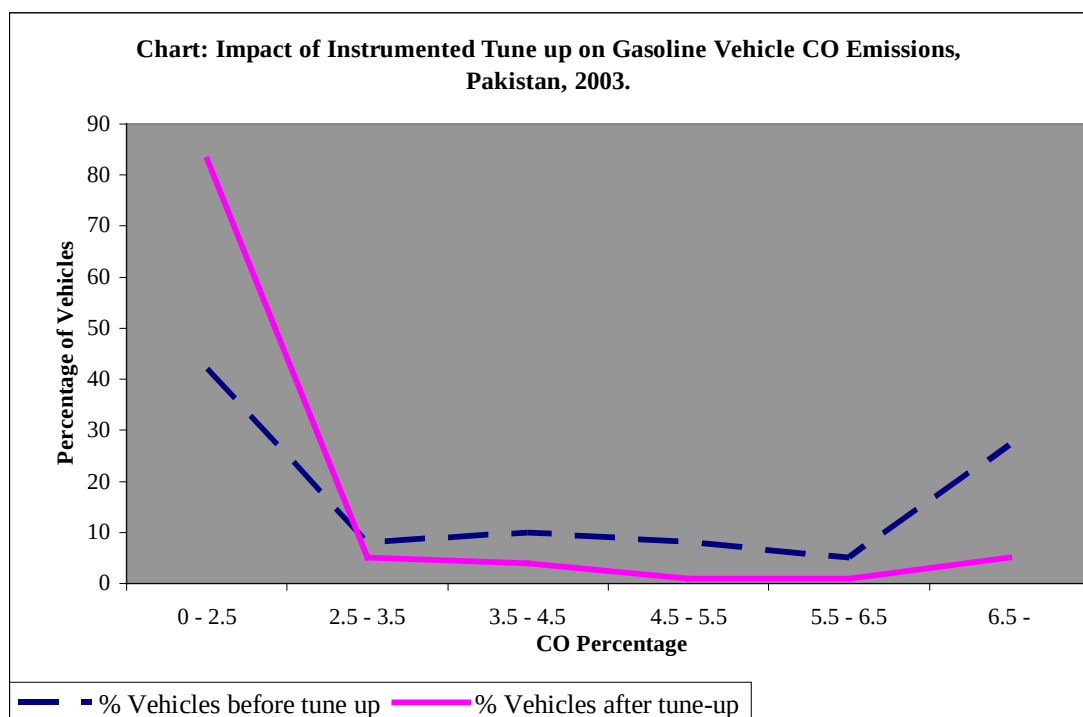
Table 6: Estimated Emissions by Fuel type, Pakistan, 2004.

Emissions	1000 Tonnes of Gasoline produce (tonnes)	1000 Tonnes of Diesel produce (tonnes)
CO	500	240
SOx	0.4	10
NOx	14	80
HC	6	50
Particulate Matter	2	40
CO ₂	2,265	2,438
CO ₂ (complete combustion)	3,080	3,120

Source: FERTS, 2004

Analysis done by FERTS project staff asserts that computerized tune-ups lead to 15% reduction in (all) emissions on average. However the study team itself was not able to do field tests on air quality or on vehicle emissions to verify this. Several studies sponsored by FERTS present a range of estimates on the impacts of tune-ups on vehicle emissions. Some are discussed below.

SEBCON (independent consultants, Islamabad) interviewed 50 motorists at ENERCON tune-up centres before and after tune-ups. Their study estimates annual reductions in smoke emissions and computes reduction in GHG emissions and fuel savings at the individual and national level. The chart below shows that before an instrumented tune-up (dashed line) 40% of the vehicles examined by SEBCON emitted 0-2.5% of CO. After an instrumented tune-up, more than 80% of vehicles emit less than 2.5% CO. On the whole, the dashed line lies above the bold line in the right side of the graph showing that *before* instrumented tune-ups, more vehicles showed CO emissions in the high range (4.5% or greater).



Source: Adapted from tune-up data collected by SEBCON from ENERCON demonstration centres.

Although most studies sponsored by FERTS examine impacts of tune-ups on vehicle emissions, their results also underscore the critical inadequacy of legislation and planning in the sector. A special study sponsored by FERTS (UNDP FERTS 2002) points out that an improvement in vehicle efficiency, due to a computerized tune-up, may result in vehicular emission reduction by 5-10% (the study does not account for an increase in fleet numbers). It also asserts that significant improvements in ambient air quality will only occur if there are other interventions such as use of unleaded fuel, improved diesel fuel quality, widespread use of catalytic converters and a phase-out of low-efficiency two stroke engines along with a modal shift to public transport.

In another study (UNDP FERTS 2002) in Lahore, it was found that more than 300,000 vehicles contribute to 90% of the air pollution caused in the city. (The industrial sector accounts for the rest of it.) A study done by the EPA (Punjab) measured the smoke opacities of vehicles in Lahore in 2001. It found that all 46 public transport buses that it examined were unfit for plying on the road (the buses were manufactured in 1999). Of 40 Daewoo buses (manufactured in 2000), fifteen were unfit for plying. These findings indicate that even existing legislation is inadequate and that vehicles routinely undergo large wear and tear which reduces their efficiency precipitously, a fact that has not been recognized by legislative authorities.²³

Thus the impact of computerized tune-ups on vehicular emissions is unambiguous although the magnitudes vary by study, location, indicator type (what gas emission was measured), vehicle sample etc. **More importantly the impact of the project on ambient air quality remains questionable.** There are several reasons for this: **Firstly**, dissemination of computerized tune-ups has been modest at best in Pakistan (227 centres in all of Pakistan). In a recent speech, a minister conceded that Pakistan needed more than three times the existing number of tune-up centres to cover the entire fleet. **Secondly**, commercial vehicles such as trucks are not subjected to computerized tune-ups although they are touted to be amongst the largest polluters, among vehicles in the country. **Thirdly**, most FERTS studies measure only the impact on carbon monoxide (CO), which is not a GHG but does contribute to ozone formation and is a precursor to acid rain. They do not however measure the impacts on PM,

²³ Recognizing this, after lengthy and detailed consultations with Pakistan EPA, FERTS subcontracted an assessment of ambient air quality in six cities of the country with four cycles of monitoring during the year. The objective of the study is to understand the status of the environment. The final report is expected "in the very near future". (FERTS project, personal communications).

HC, NO_x or SO_x except in experimental settings. **Fourthly**, reductions in CO emissions are measured *ceteris paribus* i.e. without accounting for the inevitable increase in vehicle fleets (average growth rate of vehicles in the country using data for the past decade is 6.5%). There are well-known and easily available academic studies that underscore the impact of increased fuel efficiency (resulting in lower emissions) on vehicle numbers.²⁴ **Finally**, vehicular emissions are not the only source of Gigs or air pollution in the country. Industrial pollution and smoke stacks are large contributors. However, none of the studies sponsored by FERTS acknowledge these other sources of air pollution and do a comparative analysis. Unless these sources are accounted for, it is hard to believe that reducing CO emissions via instrumented tune-ups will be able to make a large difference to air quality in the country.

B.2.4 Human Capital

The team divided impacts on human capital under two groups: i) Impact on capacity via training centres and learning; ii) Impact on human health due to reduced air pollution.

Impact on Capacity via Training Centres

The project has built relationships with ten training institutes in the country to disseminate vehicle tune-up technology. In all, 1567 mechanics and 821 workshop owners have been trained in 66 courses. Maximum class size is 30 people. Exams are held in the third week and evaluations at the end of every week. Ministers or other luminaries present completion certificates, to students in usually high profile and well-attended ceremonies, at the end of the courses. Trainees often display these certificates prominently in their workshops.

Independent studies confirm that trainees and workshop owners value these training workshops. In a study conducted by independent consultants (See FERTS Report, Zeeruk Consulting Enterprises), the impact of training on workshop owners and trainees was evaluated, using a ranking method. Workshop owners and mechanics who attended the FERTS training programs (the focus group) were interviewed, along with others who did not (the control group). The impact of training was evaluated in the context of trainee/owner satisfaction, change in income, degree of customer satisfaction and change in customer base. As Table 7 shows, FERTS project training was received positively by mechanics and workshop owners, more than a majority of whom averred that it had led to an increase in mobility, income and customer base.

²⁴ See for example Heil and Pargal (1998) and Shalizi and Carbajo (1994)

Table 7: Impact of FERTS Training on Mechanics and Workshop Owners, Pakistan, 2003

Comment/Question		Response from Me- chanics	Response from Workshop Owners
Training was	Highly Satisfactory	95%	81%
	Satisfactory	2%	5%
	Average/Low	3%	14%
Training has increased my job prospects/business potential	Considerably	91%	76%
	Moderately	5%	13%
	None	4%	11%
Training has i) Increased my salary (for me- chanics) ii) Has increased business in- come (for workshop owners)	More than 30%	8%	2%
	30%	10%	17%
	20%	15%	26%
	10%	46%	32%
	None	21%	33%
Training has increased satisfac- tion of my customers therefore customer base has broadened	Considerably	31%	55%
	Moderately	64%	23%
	No Change	5%	22%

Source: Adapted from FERTS “Computing Performance Indicators” by Zeeruk Consulting Enterprises, Pakistan, 2003.

It is interesting to see that 95% of trainee mechanics reported a broadening of their customer base as a result of increased customer satisfaction and 79% of trainee mechanics reported an increase in their pay. The study concludes that the project should “build on its success regarding the (sic) training programs by reaching out to more trainees across the country” and rates the performance of the project “very good”.

Box 4: Fikri Automobile Training Institute (FATI), Karachi

Fikri Automotive Training Institute (FATI), Karachi, has been associated with FERTS since 1997. It hosts six training courses using CRYPTON equipment for hands-on training for its students. The Centre is the sister concern of Fikri Automobiles, which was established in 1936 and has since supplied their engine and gas analyzer equipment to Shell dealerships, which have twenty tune-up centres in Pakistan and are planning to expand. The Centre has conducted twelve automotive mechanics courses over the past years. According to its owner, the objective of FATI is to develop and increase the capacity of mechanics by providing them training on CRYPTON equipment.

When the study team visited the training Centre in Karachi late in the evening, there were 25 uniformed trainees attending a class being taught by a veteran professor who also teaches at the polytechnic nearby. The venue had a relaxed atmosphere. Most student-trainees had been sponsored by their employers to attend this training course. The course is held after hours to not impede their regular workshop duties. The students had hand-books (supplied by FERTS) and the room contained a lot of training equipment used for hands-on training. Demand for these training courses, which concentrate on EFI systems, usually outstrips supply and ENERCON has mandated selection criteria for choosing trainees, applicable for all applicants in the country, across training institutes. Selection requires at least five years of experience in the automotive repair business (without a diploma) or three years (with a diploma). Women candidates are however exempt from this criteria. The owner of the Centre also informed the study team that all Shell tune-up centres had mechanics that had been trained at these workshops (although not necessarily at FATI).

Many of the students averred that they had been sent by their employers to attend these training sessions even though it meant they could only work shorter hours at the workshop. They found these training workshops to be beneficial since it made them more capable of dealing with new cars all of which had EFI systems. Training increased their job prospects, increased their chances for promotion and for salary increases. They also felt that their customers were more satisfied with their services now, compared to earlier.

Services are provided free of charge to trainees, and FERTS pays for uniforms and study material provided to the students. The owner of FATI informed the team that training workshop mechanics benefits his business and training auto repairmen is a 'long-term' strategy. It is helping to build a market for machines that they are trained on i.e. CRYPTON machines – of which FATI is the sole distributor in the country. The Centre sold fifty instrumented tune-up equipment pieces in 2002 – mostly smoke meters and emission analyzers. CRYPTON engine analyzers cost Pak Rs. 0.5 Million and emission analyzers cost Pak Rs. 0.25-0.3 Million.

Source: Local Benefits Study Team Field Consultations, Pakistan, 2004

Impact on Human Health

Establishing the impact of computerized tune-ups on human health requires that the following relationships hold: First, that computerized tune-ups reduce vehicular emissions; Second, that air pollution caused by computerized tune-ups has reduced on a large enough scale to impact ambient air quality in Pakistan *ceteris paribus*; Thirdly, that there have been no alleviating exogenous factors affecting air quality or that one is able to control for them to assess the impact of reduced emissions on ambient air quality; and Finally, that there is a causal relationship between air quality and human health.

The first and the final link are well established. In Section B.2.2.3 we established that computerized tune-ups do reduce vehicular emissions. The causal relationship between air quality and morbidity is also well documented and researched in the academic/medical literature.²⁵ Air pollution related afflictions are mostly related to upper respiratory tract infections and sinuses. Doctors in Pakistan also

²⁵ See for example Murray and McGranahan, 2003 for an excellent collection of articles on the subject.

mention increasing costs of medicine and hospitalization as evidence of increasing urban air pollution. In the long-term a general reduction in vehicular air pollution (and noise/vibration) may have a beneficial impact on the health of the general population both rich and poor. However this assumes pollution from other sources is controlled for. This scenario is by no means certain, given that it is the urban poor who are most likely to live in conditions, which predispose them to higher exposure to pollutants and are at higher risk because of malnutrition. There is very little evidence or research on the impact of fuel emissions and health issues in Pakistan *per se*.

It is the second link above that must be questioned: **There is little evidence that reduction in air pollution caused by computerized tune-ups has led to improved ambient air quality in the country** or even in specific geographic locations. This lack of evidence may be because of three reasons: **First**, that computerized tune-ups are not widespread enough for them to have a large enough impact on air quality. This has been discussed in some detail above; **Second**, that there are other alleviating factors which are diminishing the impact on air quality in the area/country such as increases in industrial air pollution or increases in vehicle fleets; and **Third**, that ambient air quality has not been examined consistently across areas or over time to judge quantity trends. In the absence of such evidence, it is hard to conclude that instrumented tune-ups have had any impact on human health.

B.2.5 Physical Capital

The FERTS project impact on physical capital is limited to 27 instrumented tune-up centres that have been installed in participation with the private sector. However there are indications that demand for tune-up equipment is increasing, indicating post-completion sustainability of the project: In response to advertisements in the national press for establishing demonstration tune-up centres, the project received more than eighty letters of interest from filling stations and workshop owners from all over the country. There is also evidence that other improvements in physical capital such as roads/transport conditions (e.g., road planning, maintenance etc) may be catalysed by the project studies.

B.2.6 Global Environmental Benefits

The global environmental goal of the project is to mitigate GHGs, mainly CO₂. Based on FERTS data from tune-up centres (1999-2003) project activities resulted in mitigating 129,333 tons of CO₂. This included a significant improvement during 2001-3 from 36,297 to 53,129 tons of CO₂. The project has not directly emphasized CO₂ (GHG) emission reductions as part of its awareness and outreach activities, but has instead focussed on local air pollution and financial benefits to promote changes in behaviour. If, as the project projects, 650 instrumented tune-up centres become operational, Pakistan could mitigate 1.28M tons of CO₂ per year, *ceteris paribus*.

B.2.7 National Benefits: Policy and Legislation

The impact on national policy and legislation was assessed on two fronts:

Building Synergies with Government Departments and Contributing to Legislation

The project has been able to build critical synergies with law enforcement agencies (e.g. the police, MVE etc.), EPA, road and transportation and telecommunication agencies (NHA and NTRC) and other NGOs and professionals at ARUP, PEEMAC and MCG. In a study sponsored by FERTS, an independent consulting firm studied the impact of the project on agencies, synergies built and on fifty owners/drivers of commercial vehicles regarding their perceptions about enforcement of vehicle inspection regulations and over-loading practices. Officials from several departments were also contacted – NTRC, NHA, MVE, Traffic police and the environmental squad.

A majority of the officials believed that before the project, regulation was rarely enforced and there was little coordination between agencies. Officials from these participating agencies along with professionals at NGOs such as ARUP, PEEMAC and MCG, also averred that the National Highway Safety Ordinance 2000 (NHSO-2000) was enacted as a result of critical awareness created by the pro-

ject. (The ordinance contains clearly defined penalties for malfunctioning vehicles.) Five government officers and five professionals from participating NGOs were also asked to score (between 0 (very bad), to 10 (very good)) the project's performance regarding effectiveness and synergy developed between government agencies. Government officers awarded an average score of 7, NGO professionals – an average of 8 (See Table 8).

The study also examined the impact of studies carried out under the aegis of FERTS. So far eighteen studies have been conducted, of which ten have been completed. All participants claimed that the project had sponsored relevant studies, the subjects of which were determined by a participatory process. FERTS staff also awarded study contracts in a transparent manner albeit with some delay. However, neither documents related to the project, nor the independent study, comments on the success of these studies in catalyzing policy/legislation. It is apparent that linkages have been built with other agencies and that at least some critical awareness regarding inadequate legislation and enforcement has been created due to these studies. But the extent of this impact is unknown especially because legislation remains a 'work in progress'. Since capacity development and legislation is one of the key niches where GEF funding can create a large impact, it is important that adequate indicators for this impact be developed.

Contribution of the Project to strengthening Agencies, including the Motor Vehicle Examiner's (MVE) Office and NHA

Motor vehicle inspection standards in Pakistan have been long decried as being too lax and insincere. However FERTS seems to have made some impact on catalyzing change. A majority of the drivers/vehicle owners who were interviewed for the study discussed above said that vehicle inspection process had improved since the project started. A large percentage of respondents believed that the process had become more stringent. An interesting and positive finding is that although many respondents believed that vehicle inspections had become more stringent, they did not dislike the increase in enforcement. This indicates a change in attitudes – and may be attributed to the project. However the study team's interviews indicated that the MVE still needs to be strengthened with more resources for effective enforcement.

Table 8: Impact of FERTS on the Motor Vehicle's Examiner's Office: Survey of Respondents, Pakistan, 2003.

Comment	Agree (%)	Disagree (%)
MVE Inspection process has changed over the past 5 years.	80	20
Inspection process at MVEs has become more stringent*	93	7
Inspection process at MVEs has changed for better*	88	12
Vehicle Inspection process on roads has changed over the past 5 years	83	17
Vehicle Inspection on roads has become more stringent*	95	5
Penalties/No. of Challans has increased*	85	15
Overall inspection process on roads has changed for better*	84	16

*Of those who believe the process has changed. Source: FERTS, Zeeruk Consulting Enterprises, 2003

The study also finds that the project has propelled the National Highway Authority (NHA) to take steps in curbing overloading. Overloading is detrimental to highway surfaces and damages the environment due to inefficient use of fuels and costs the national exchequer. This achievement is especially noteworthy since synergies and cooperation between relevant government agencies (NTRC, NHA and NLC) leaves much to be desired.

On the whole with respect to **FERTS' impact on national policy and legislation**, we make mainly two recommendations: **First**, that FERTS focus its efforts on securing necessary legislation that empowers government agencies in enforcing legislation. This can be done via focussing on training offi-

cers within agencies such as MVE and NHA and by securing funds for agencies like the MVE²⁶ and for the NRTC to help them effectively enforce legislation. **Second**, FERTS must capitalize on the studies that it has commissioned. They fill an important gap in the state of awareness/knowledge in the nexus between transport, air quality and health, and can be used to provide the backbone for a sound strategy dealing with vehicular emissions. However to push this forward, FERTS must collate the messages and knowledge from these wide-ranging studies and create awareness amongst its GoP and NGO counterparts, and the public. Galvanizing new legislation will require not just a one-shot stakeholder workshop during which the results of these studies are discussed but a consistent long-term strategy directed at creating awareness and sensitivity at all levels of government and civil society.

²⁶ MVE suffers from lack of resources and also a very ambitious revenue target that impairs their ability to focus on enforcement of legislation. Ironically high revenue targets do not translate into resources. When the study team visited the MVE office in Islamabad, the office consisted of one room, which did not have a telephone or a computer. Three people, constituting the entire office were huddled into one office. The officers also mentioned that a post at MVE represented the end of the line for them in terms of professional development. Officers could not get posted to better positions with the Ministry of Transportation and were very ill-paid.

C. KEY FINDINGS AND LESSONS

This final section of the report sets out the study team's main conclusions. The first sub-section summarizes some of the key achievements of the project. The second sub-section C.2 lists challenges of the project in the context of maximizing global environmental benefits and building linkages with local benefits. In C.3 we discuss key lessons learnt to assist GEF in designing and implementing similar projects in the future.

C.1 ACHIEVEMENTS

This section highlights FERTS project key findings in term of the achievements. Most positive impacts of the project are on social/institutional capital and human capital. It is impossible to deduce much about the impacts of the project on natural capital.

The project has impacted financial capital growth by providing a more faithful customer base for workshop owners and vehicle mechanics. For workshop owners although pay back periods for computerized tune-up equipment varies from 3 to 10 years depending on the type of equipment. Many agree that hosting demonstration tune-up centres has added to their visibility, built trust amongst customers and led to repeat business. Customers are happy to see manifest evidence of improvements in vehicle efficiency rather than depending on the exhortations of manual tune-up mechanics. Instrumented tune-ups also encourage vehicle owners to be more sensitive to road conditions and fuel quality and allow them to get the best out of their vehicles. This reduces maintenance costs and emissions in the long run. The project's advertising campaign has also been instrumental in alerting civil society to the benefits of computerized tune-ups.

The project has helped build social capital by building critical linkages and networks with/in the private sector and GoP. The project's links with the private sector are especially noteworthy. This relationship is creditable especially because tune-up technology has yet to prove viable as a stand-alone enterprise. Amongst others the project has built critical relationships with gasoline companies such as CALTEX and Royal Dutch Shell, and car and motorcycle manufacturers/dealerships such as Suzuki and Toyota as well as workshop owners. The project has also linked with private sector to provide training services. Many stakeholders and particularly workshop owners proudly displayed the ENERCON/FERTS relationship on their workshop entrances, testifying to the reputation that ENERCON has built for itself. This is an exceptional achievement of the project and it is critical if the project's 27 demonstration centres are to make an impact and move beyond being just *demonstration* centres. There is also important awareness about the project within GoP and related agencies. FERTS' studies are recognized as providing significant inputs to policy making and legislation. These are particularly vital in the transport/environment nexus where information is minimal and disparate, if present at all. Finally, by aligning itself with civil society organizations such as ARUP, FERTS is displaying the requisite vision and understanding essential for a (primarily urban) grassroots movement necessary for legislation and enforcement.

FERTS has helped to also create social capital and reduce vulnerability by training otherwise illiterate vehicle mechanics. Vehicle mechanics have low job mobility and non-existent professional support structures. Training courses have helped both: made them confident of their abilities and helped to foster an atmosphere of trust and help amidst them. The recent ingress of EFI systems would have specially made many skills obsolete. But focussed and well-directed training, where mechanics are provided uniforms, books and hands-on training is helping mechanics to adapt to a new economy. Mechanics are also trained in dealing with women drivers and the project specially encour-

ages women drivers and women workshop owners to tune cars and host demonstration sites respectively.

C.2 CHALLENGES AND RECOMMENDATIONS

It is clear that the project has the potential to build very strong linkages between its global objectives and local benefits. Keeping in view the GEF mandate of achieving global environmental benefits, we suggest that this is not an incidental linkage but is a *sine qua non* for the success and post-completion sustainability of the project. This linkage underlies many of the project's activities and their rationale. Below we briefly discuss the projects main weaknesses and make recommendations for next steps.

An over-arching presumption that a focus on the supply-side will serve as an 'engine of growth' for developing an instrumented tune-up market. The project relies heavily on providing training to auto mechanics, encouraging workshop owners to set-up instrumented tune-up centres and (will soon be) subsidizing purchases of instrumented tune-up equipment. However its efforts in increasing the demand for instrumented tune-ups even though instrumented tune-ups are economically a superior option to manual tune-ups remains modest. This represents a missed opportunity. It is rare that new technology options are *also* economically viable options for end-use consumers: Instrumented tune-ups cost the same as manual tune-ups but secure more fuel savings, make vehicles more efficient and ensure a longer life. Instrumented tune-ups also come bundled with other attractive options such as free oil changes and vehicle diagnostics. The project has failed to capitalize on this. Awareness campaigns, tune-up camps and alliances with NGOs such as WWF, GoP and civil society participants such as ARUP are creditable efforts. However these are manifestly insufficient. **Unless the demand side of the market is focussed on, it is unlikely that instrumented tune-ups will be a widespread market phenomenon.** To overcome this, the study makes several recommendations: **Firstly** the project must galvanize legislation and enforcement of vehicle efficiency, fuel quality and emission standards. Mandatory standards will provide the requisite demand side push. **Secondly**, the project must disseminate technology at a faster rate so that the technology 'takes off'.²⁷ This will have another positive impact on the market for tune-ups: Higher demand for instrumented tune-ups will make instrumented tune-up centres economically viable and help to transform the market. Only then will the project be able to meet its ultimate global environmental objective of making an impact on ambient air quality and reducing GHG emissions. **Finally** the project (and any subsequent initiative) must also focus on commercial vehicle drivers (trucks and auto-rickshaws). These constitute a large percentage of the current vehicular fleet in Pakistan where rail transportation is almost non-existent. Admittedly this requires a different set of incentives since drivers of commercial vehicles rarely own these vehicles. Arguably, their incentives are usually skewed towards extracting the most out of a vehicle rather than ensuring its long life and efficiency. However unless this part of the end-use consumer is addressed, a large part of the potential market for instrumented tune-ups will remain untapped. Project impacts will remain marginal.

Slow dissemination of instrumented tune-up technology. Achieving the project's global environmental objectives is predicated on wide dissemination of instrumented tune-up technology. Currently the project's demonstration centres have been installed in relatively affluent and visible DODO vehicle workshops and oil distribution outlets. **Unless the small and medium workshop owner/operator is able to host this technology, it is unlikely that instrumented tune-ups will become *de rigueur*.** Another un-intentioned impact of housing these demonstration centres in niche foreign car outlet sales centres is that these cater to relatively affluent sections of society. Thus the gasoline powered private vehicle is mostly targeted. The more significant contributor to vehicular emissions namely **the commercially driven diesel vehicle, characterized by low maintenance and high levels of inefficiency and emissions, is ignored.** This is an important omission. Unless requisite incentives/legislation for this part of the vehicle population is planned, project impacts will be partial. A strategy for dissemi-

²⁷ See for example the 'inverted J-curve' of technology dissemination in Griliches, 1957.

nating this technology widely is to enable the average entrepreneur to install instrumented tune-up equipment.

Another means of redressing this weakness is to **activate the RLF as soon as possible**. The RLF is a crucial component of the project. It was anticipated that the RLF would be able to subsidize capital to small and medium sized enterprises in the transport sector. This would allow not only smaller entrepreneurs to use this technology and raise their income earning prospects in a market that is increasingly populated by EFI system vehicles but also allow the average income car owner to take his car for tune-ups.

Sustainability As a follow-on from the above, the sustainability of the impacts of the project are predicated on two factors a) The ultimate execution of the revolving fund and its ability to disburse funds in a transparent and widespread manner; b) The ultimate economic viability of purchasing tune-up equipment, given (a). Unless owners of equipment do not find it economical by itself (and not by cross-subsidizing across services within their workshops) to purchase this equipment, it seems unlikely that amounts provided as loans from the RLF will be recovered or that market development will be achieved. **RLF's sustainability is obviously dependent on savings realized by owners of tune-up centres whose repayment capacity in the long run depends on them being able to raise the prices of tune-ups per car** (unless the cost of equipment falls over the next few years). In turn, raising the price of computerized tune-ups per car is dependent on several factors: **Firstly**, vehicle owners have to realize the importance of computerized tune-ups. **Secondly**, vehicle owners have to be willing to pass on some savings realized from computerized tune-ups onto workshop owners so that supply of tune-up services is lucrative for workshop owners. **Thirdly**, there should an increasingly widespread perception of a low risk associated with loans for purchasing tune-up equipment. This is necessary if the technology is to disseminate widely. **Finally**, since loans must also be provided to less than affluent workshop owners, banks and FIs have to have less stringent conditions for collateral and fuel savings should be recognized as part of debt servicing.

Viewing FERTS' studies as an end by themselves. Studies addressing the nexus between transportation and environment are one of the principal contributions of the project in creating awareness, fostering relationships and filling a yawning knowledge gap in the sector. **There is a risk however that FERTS and its staff see this as an end rather than as key inputs into policy and legislation.** At this moment it is unclear how these studies will filter into GoP policy making in the transport sector. In this area FERTS should acknowledge the following: **Firstly**, although FERTS has built many informal relationships, it must build formal relationships, which transcend the information providing role it currently plays. If ENERCON is recognized as a partner in GoP it will provide a platform for studies to be discussed and policy related inputs. **Secondly**, FERTS staff should collate and transform its studies' results into a set of comprehensible and practical recommendations. These must be rigorously communicated not just in one stakeholder meeting but in several meetings and widely, over a period of time, with GoP, NGOs and civil society organizations. Only then will the appropriate awareness and pressure be built on an urban grassroots movement to bring about traffic related legislation. In this context, FERTS still has US\$1.2 Million remaining that has to be disbursed (not including the RLF funds). The project should use part of these funds for pushing results and recommendations and bringing about policy changes. Clearly there is a need for concerted national legislation and policy making which FERTS can galvanize if not directly impact.

C.3 LESSONS FOR GEF PROJECTS: IMPLICATIONS OF LOCAL BENEFITS ON PROJECT DESIGN

Use of GEF funds – technology push vs. technology pull. In the context of transport related projects it is important to question whether a FERTS-type project which aims to transform a market in an urban setting, by focussing on the private vehicle sector, is a repeatable idea. Although the study finds that FERTS itself has several merits, we suggest that GEF funds are probably better spent in other areas. This is for two reasons. **Firstly**, vehicular emissions are better controlled by altering behaviour such as reducing driving times, urban planning or exhorting a move to mass means of transportation.

Frequently, increasing vehicular efficiency leads to increases in vehicular fleets or increases in driving distances. This nullifies the initial expected reduction in emissions. **Secondly**, particularly in the case of instrumented tune-ups, which are necessary for EFI system vehicles, it is ambiguous if a FERTS-type project is actually *incremental*. EFI vehicles can only be tuned using instrumented equipment. Arguably the ingress of instrumented tune-ups is inevitable. FERTS is well intentioned in that it is catalyzing this transformation. However the tension between technology push vs. pull remains and needs to be studied closely.

Replication and the importance of local benefits. It is important to recognize that procuring local benefits is important for project replication. Given the GEF mandate of achieving global environmental benefits, local benefits, where applicable should be admitted in a lexicographic manner i.e. it should be recognized that local benefits could strengthen the impacts of a project aimed at achieving global objectives.

Creating sustainable financing mechanisms in GEF projects remains a source of concern. Two main problems seem to often assail plans for financing mechanisms, especially in the climate change portfolio: **First**, that often these mechanisms such as revolving loan funds require additional supportive legislation to enable them. Repeatedly, such legislative mechanisms take a long time to set up. This is also true of the RLF in FERTS. **Second**, usually projects only plan to set up these financing mechanisms with little attention to their sustainability afterwards. Thus repayment capabilities and transforming the financial sector are seldom part of GEF project plans, or, even if they are, projects rarely reach this stage during their lifetime. Sustainability of financial mechanisms has to be thus grandfathered by stakeholders after GEF has completed the project, often to little success. This must be remedied if GEF projects have to make long-term impacts.

Engaging the private sector. GEF projects must engage the private sector if they are to have any impact whatsoever. This emphasis on aligning itself with the profit driven private sector will also ensure that project designs have attainable objectives and suitable sustainable financing mechanisms that are not subsidy driven in perpetuity.

Developing capacity at the local and national level via policy and legislation. Although GEF is the largest single environmental fund in the world, it is spread thinly. Funds at the national level are thus scarce. To get the most returns for every dollar invested, it is suggested that GEF funds be spent on enabling legislation and building capacity within local and national governments.

Annex 1 CASE STUDY TERMS OF REFERENCE

Duration:	7 working days (approx)
Start date:	April 28 th – May 7 th 2004
GEF Team Leader	Lee Alexander Risby (GEF M&E)
Team Member	Jyotsna Puri (UNDP GEF)

Objective of the Portfolio Wide Study

The GEF mandate incorporates the role of local benefits through its emphasis on a sustainable development approach and by requiring that the programs and projects it funds be country-driven and based on national priorities designed to support sustainable development. In this study, local benefits are defined as:

“Project outcomes, which directly or indirectly have positive impacts upon people and ecosystems within or adjacent to project areas, and which provide tangible gains in the livelihoods of communities and the integrity of ecosystems.”

The GEF is conducting a portfolio wide study to better understand the relationship between local benefits and the attainment of global environmental benefits. The objective of this study is to assist in maximizing the level of local benefits included in future GEF policy, strategies, programs, project design and implementation within the context of GEF’s mandated focus on global environmental benefits. The study includes in-depth desk reviews, internal and external expert interviews as well as primary and secondary fieldwork case studies.

The Pakistan Fuel Efficiency in the Road Transport Sector project has been selected as a case study because of the explicit linkages the project design make between improvements in local benefits (particularly health, income and employment benefits) and the attainment and sustainability of global environmental benefits. The project has a strong potential to yield critical findings, lessons and recommendations, which will inform the future development of GEF interventions in the Climate Change focal area.

Objectives of the Case Study

The objective of the case studies is to understand the relationship/linkage between local benefits (and/or negative impacts) and the attainment of global environmental benefits of the GEF supported project: Pakistan Fuel Efficiency in the Road Transport Sector.

Scope of Fieldwork Investigation for the Project

The Study Team will report on progress in achieving results relating to project objectives, outputs and outcomes, within the specific context of (depending on availability and quality of data):

Assessment and description of the types and scale of local benefits and negative impacts, intended or unintended, which have resulted from the GEF project, including local perceptions of the benefits and impacts.

Examination and description of the nature of the links between local benefits and the attainment of global environmental benefits (according to project environmental indicators)²⁸. This will be based on an analysis of linkages in terms of how global environmental benefits can affect local bene-

²⁸ See Annex

fit/negative impacts and how the generation of local benefits/negative impacts can affect global environmental benefits.

Evaluation and description of the extent to which the strategy and environmental management options in the project design and implementation properly incorporated the opportunities to generate greater levels of local benefits: essentially looking at what the projects did not do, as well as what they did do.

Analysis Framework and Expected Outcome

The case study will address the following questions:

What are the overall objectives and outcomes of the project?

Overview of the investment: a brief profile of the project being evaluated, which describes the project policy and institutional context, structure, objectives and anticipated results (outputs, outcomes, impacts) and relates this to the host country's development context. Specifies intended local benefits and target groups. Based on existing documents and on interviews with stakeholders.

Overview of Global Environmental objectives and achievements of the project: This overview will be done based on existing documents and interviews with expert stakeholders. It will include an assessment of the accomplishments of GEF funded activities in supporting institutions, policies and activities that contribute to the improvement in biodiversity conservation. It will include a review of the environmental resource characteristics of the area.

What have been the local impacts (human and environment)?

What are the types and scale of local benefits and negative impacts?

The study will assess the projects positive and negative impacts using a livelihoods approach focusing on livelihood capitals, including natural, financial, social and institutional, physical and human capitals. (See Annex A: Model of Livelihood).

This analysis will be differentiated by gender within each stakeholder group. Attention will be paid to indigenous/ethnically distinct people and other disadvantaged stakeholders where they constitute a distinct group.

What are the impacts of the GEF project in the relationship of local level processes to wider social (including gender), economic and environmental processes?

The study will examine how impacts on the various capitals have affected resilience and vulnerability of local communities to shocks from external factors that are normally beyond their control. Stronger or weaker livelihood capitals are assumed to lead to higher or lower resiliency respectively. The study should try to assess the extent to which this assumed relationship is actually taking place or at least should provide evidence that the impact on capitals is resulting in higher or lower resiliency. This assessment can be done by looking at processes that: occur at different levels but have a direct impact on local populations, two examples are:

Processes at the local level such as better-organized communities (social capital) that are more capable to respond to food insecurity and natural resource variations (e.g., drought).

Changes in external institutions such as laws and regulations that might result in benefits or costs at the local level.

What are the contributions or detriments of the project's local impacts (positive or negative) to the attainment of global environmental benefits?

The study will identify the links (positive and/or negative) between local benefits and the global environment. The following are four examples of possible patterns that the study might consider to assess these links:

Changes in production and consumption patterns that reduce or exacerbate global environmental stresses.

Cumulative local environmental changes that over large areas can have positive or negative global environmental consequences (e.g. deforestation or reforestation).

Reduction of vulnerabilities that can contribute to changes to the balance in policy priorities (e.g. moving from the urgency of poverty reduction to improved environmental management).

Changes in the external institutional environment, (e.g. the development of better governance as a consequence of local level empowerment and greater public awareness and political support for environmental issues)

Considering the projects objectives, did the overall strategies and environmental management options selected in the projects effectively incorporate the opportunities to generate local benefits? Specific attention will be paid to opportunities for women, the poor and minority groups, as these are more likely to be overlooked in project design and implementation.

What are the key findings and lessons to be learned from the project²⁹?

Stakeholder Involvement

The Study Team will use appropriate participatory methods, to ensure active and meaningful involvement by investment partners, beneficiaries and other interested parties. Stakeholder participation will be integrated in fieldwork design and planning; information collection; development of findings; evaluation and verifying findings.

Methodologies

The Study Team will develop methodological tools for data collection based on the project contexts. The methods may include quantitative and qualitative approaches³⁰, such as survey questionnaires, focus groups and formal and informal semi-structured interviews. Identification of the suite of methods will be context dependent but be agreed by the Team Leader and other Study Team members.

The Study Team will:

Conduct national-level stakeholder interviews with:

GEF focal point.

Government Ministries and Departments.

Environmental NGO and Community CBO representatives

Survey project documentation and correspondence

²⁹ Including any relevant accountability issues, such as elements of approved project plan, which were not implemented?

³⁰ Given the time and resource constraint they are may be limited to qualitative approaches.

Interview/conduct focus groups etc with key local stakeholders (e.g. project managers, local government officers, local beneficiaries (including gender groups, local NGOs/CBOs, and the private sector).

These activities will further establish the data inputs into the case study report.

Accountabilities and Responsibilities

The GEF M&E Team Leader of the project study is responsible for:

Overall responsibility and accountability for the case study

Distribution of all materials relevant³¹ to the case study prior to fieldwork

Coordination within the Study Team to implement fieldwork

Guidance throughout all phases of execution

Approval of all deliverables

Co-ordination with other case studies

The Team Members (Implementing Agency staff) are responsible for, where necessary and as requested:

To be well acquainted with the project prior to fieldwork.

Cooperate with the Team Leader and other Team Members (IA) to develop and implement a fieldwork program.

Provide progress reports (e.g. on stakeholder interviews not attended by the Team Leader or other Team Members).

Provide input and comments on fieldwork outputs.

Provide inputs to produce a draft and final report (commenting, editing and writing)

In the event of any differences of opinion concerning findings, lessons and recommendations contained within the report, Team Members will submit these in writing to the Team Leader for inclusion in an annex to the final report

Deliverables

The Study Team will prepare:

Case Study Report (draft and final report)

The report will be submitted to the GEF Overall Study Team Leader (Dr. David Todd)

Draft Case Study Report

³¹ Project design documents / Project Implementation Reports / Mid-term and Terminal Evaluations and any other material considered necessary.

The first draft of the report will be produced by the Study Team by 10th July and circulated to project stakeholders for comments. Project stakeholders will be given 7 days to comment on the draft case study report (by email or fax).

Final Case Study Report

The final case study report will incorporate key stakeholder comments, as appropriate.

The Conceptual Framework

The main elements of this framework are a typology of local benefits, an identification of the ways that local benefits can enhance global environmental benefits and a model that links both local and global benefits to the dynamics of local people's livelihoods. The framework is depicted in Figure 1.

The typology identifies five generic categories of improvement to livelihood capital, which can be seen as the core of local benefits in global environmental projects:

Improved access to **natural capital**, including plants and animals harvested from the local resource base, surface and ground water, fuelwood and environmental services such as safe waste disposal and tourism and recreation values. Such changes will increase the sustainability of **resource management**, reflected in factors such as the reversal of ecosystems deterioration, retained biodiversity values, the regeneration of forests, rangelands and wetlands and improvements to water quality.

Increased **livelihood opportunities, income** and **financial capital**. This includes increases to the productivity of existing and opportunities for new livelihood activities such as farming, fishing or tourism, increases in cash income and improvements to the ability to save or availability of capital.

Improved **social capital, equity** and **institutional capacities** in local communities. This reflects the enhancement of community-level institutional capacities and contact networks and the improved ability in local communities to deal with outside agencies. It also reflects improvements to gender and social equity at the local level, especially through the empowerment of women and minority groups in decision-making.

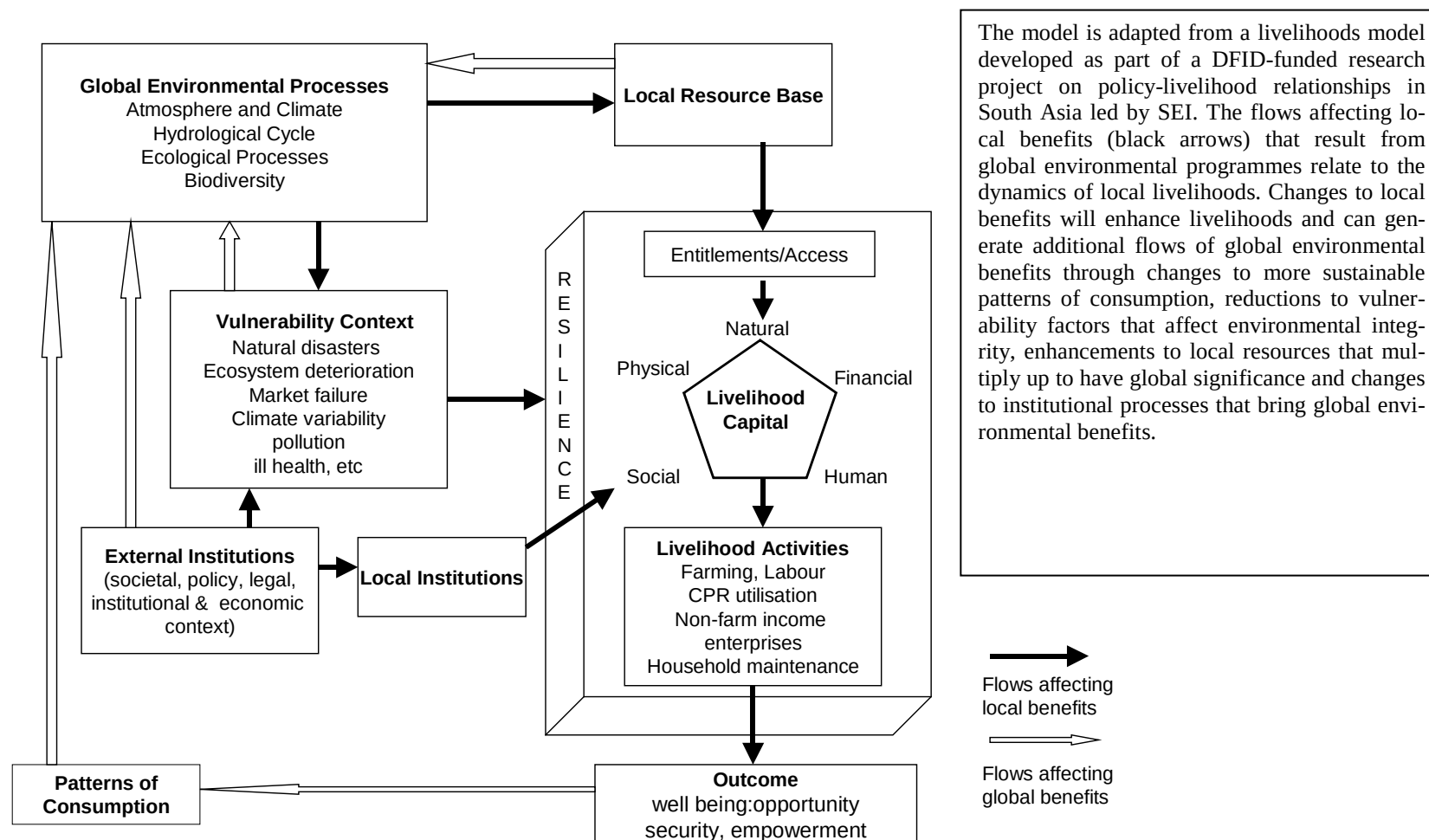
Improvements to **physical capital**, including investments in tools and machinery, access to or the ownership of land and buildings and access to infrastructure such as transport, telecommunications or water supply and irrigation.

Improvements to **human capital**: the skills, knowledge, work ability and management capabilities of local community members. There is typically a need for a gender focus in this that emphasises issues such as functional literacy and management skills of women.

Increases in the livelihood capitals available to communities will promote improved **health and food security**, including improvements to key indicators such as child and infant mortality, reduced morbidity from diseases that reflect poor environmental conditions and improvements to both the absolute level of nutrition and a balanced diet.

Strengthened livelihood capitals and improved health and food security will, in turn increase the **resilience** of local communities to withstand shocks from external factors that are beyond their effective control. Increased resilience in turn promotes reduced **vulnerability** to, for example, natural disasters such as floods, droughts and cyclones, environmental degradation, loss of ecosystem integrity, deforestation and climate change and variability as well as to such forces as social, political and market disruption.

Figure 1: GEF Model of Livelihoods and Benefits Flows in Global Environmental Programs



Annex 2 References

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- Heil, Mark and Sheoli Pargal (1998) *Reducing Air Pollution from Urban Passenger Transport: A Framework for Policy Analysis*, World Bank, Washington DC.
- Ministry of Environment (1992) *National Conservation Strategy*, Government of Pakistan.
- Murray, Frank and Gordon McGranahan (eds.) (2003), *Air Pollution and Health in Rapidly Developing Countries*, Earthscan.
- Pakistan's National Conservation Strategy: Renewing Commitment to Action, Report of the Mid-term Review, by A.J. Hanson, S. Bass, A.Bouzaher, G.M.Samdani, M.Zehra, November 2000.
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- UNDP FERTS (2000b) *Identification of Special Studies for FERTS*
- UNDP FERTS (2000c) *Communication Strategy for FERTS*
- UNDP FERTS (2001) *Gender Strategy for FERTS*
- UNDP FERTS (2002a) *Computation of Project Performance Indicators on Degree of Enforcement of Regulations to check Over-Loading Practices*
- Computation of Project Performance Indicators on Studies Developed into Policies
- Computation of Project Performance on Trainee Mechanics/Workshop Owners Satisfied with Training and Earning Better Income
- Development of Scope of Work for Computing the Performance Indicator to Assess Concentration of Toxic Chemicals in the Human Body
- Computing the Performance Indicator to Assess Level of Awareness of Citizens towards Negative Effects of Vehicular Pollution/Emissions
- Computing the Performance Indicators to Assess Percentage Reduction in Smoke-Emitting Vehicles in the Road Transport Sector
- Computing the Performance Indicators to Assess Annual Reduction in GHG Emissions in the Project Target Area

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Computing the Performance Indicators to Assess Savings from Reduced Fuel Consumption for Vehicles Owners

Computing the Performance Indicators to Assess Fuel Saving Emanating at the National Level from Proper Tune-Up Practices and Awareness Campaign

UNDP FERTS (2002b) Strengthening the Institution of MVE in Pakistan

UNDP FERTS (2002c) Study on Institutionalized Training of Drivers/Controlling Organizations in Pakistan

UNDP FERTS (2002d) Study on Self-Regulation to Control Overloading of Trucks by the Trucking Industry of the Country.

UNDP FERTS (2004) Implementation of FERTS by Iftikar Raja

Walsh, Michael (2003) Reducing Emissions from Motor Vehicles in Asia: A Comprehensive Strategy, ADB, Manila.

Annex 3 Fieldwork Itinerary

28 April 2004, Wed	(Arrival of Mission in Karachi)
29 April 2004, Thu	(Karachi)
0930	Introductory meeting with Project staff
1100	HinoPak – a partner
	Lunch break
1430	Visit to Toyota Southern Motors – tune-up demonstration center
1630	Meeting with trainee workshop owners
30 April 2004, Fri	(Karachi)
1000	Meeting with ArchVision – a consultant
1130	Visit Shell Pakistan - replication of tune-up centers
	Lunch break
1900	Visit Fikree Training Center
1930	Meeting with trainee mechanics
01 May 2004, Sat	(Karachi/Lahore) (Holiday in Pakistan)
1400	Departure from Karachi for Lahore
1800	Meeting with MASCON - a consultant firm
02 May 2004, Sun	(Lahore) (Weekend)
	Visit to historical places (Jamma Masjid, Lahore Fort, Sikh Temple)
03 May 2004, Mon	(Lahore/Islamabad) (Holiday in Pakistan)
1000	Meeting with ECF Director
1340	Departure from Lahore for Islamabad
04 May 2004, Tue	(Islamabad)
	Meeting with Environment Unit UNDP CO
	Meeting with Pak EPA
	Meeting with Minister
	Lunch break
	Meeting with the Secretary
	Visit to NISTE Training Center
	Meeting with trainee mechanics
05 May 2004, Wed	(Islamabad)
	Visit to ENERCON – an introduction
	Project – an introduction
	Meeting with owners of demonstration centers
	Lunch break

	Meeting with MCG – a consultant
	Meeting with JICA
	Meeting with ARUP – a partner
06 May 2004, Thu	(Islamabad/Karachi)
	Visit to air quality monitoring site
	Meeting with MVE/TA
	Meeting with NTRC/NHA
	Meeting with Environment squad
	Lunch break
	Meeting with independent consultant
	Meeting with other stakeholders
1900	Departure of Mission from Islamabad for Karachi
07 May 2004, Fri	(Karachi)
0845	Departure to New Delhi, India

01.	<u>EXISTING INSTRUMENTED TUNE-UP FACILITIES IN PAKISTAN</u> To collect information on existing instrumented tune-up facilities in the country. The collected information will be applied for designing the revolving loan fund disbursement programme.
02.	<u>IMPROVING VEHICULAR EMISSION STANDARDS IN PAKISTAN</u> The study aims to develop realistic vehicular emissions standards and the action plan/mechanism for proper implementation of the emissions standards
03.	<u>STRENGTHENING THE INSTITUTION OF MOTOR VEHICLE EXAMINERS (MVE) IN PAKISTAN</u> Revival and reformation of the institution of MVE in the country.
04.	<u>INSTITUTIONALIZED TRAINING OF DRIVERS /CONTROLLING ORGANIZATIONS IN PAKISTAN</u> Inculcate better driving proficiency in the drivers and streamline the procedures for issuance of driving licenses, through institutionalising the training of drivers.
05.	<u>VEHICLES OPERATING ON CNG IN THE COUNTRY: INSTALLATION OF CNG KITS, THEIR OPERATION AND MAINTAINENCE AND SAFETY ASPECTS</u> Analysis of the ground realities regarding the installation of CNG conversion kits on gasoline operated vehicles in the country, formulation of recommendations on the correct installation of CNG conversion kits, and preparation of guidelines for the proper tune-up of vehicles operation on CNG.
06.	<u>IMPACT OF FUEL (GASOLINE AND DIESEL) QUALITY ON FUEL EFFICIENCY AND EMISSIONS</u> Establish seriousness of the problem of adulteration of fuels by determining the sources and types of adulteration, determine the extent of adulteration, and establish relationship between adulteration and emission levels and adulteration and fuel consumption.
07.	<u>EMISSIONS REDUCTION AND FUEL CONSERVATION THROUGH FLEET MANAGEMENT</u> Implementation of journey management to conserve energy, improve environment, ensure public safety at large, and save the loss of life and property.
08.	<u>ASSESSMENT OF CURRENT LEVELS OF FUEL EFFICIENCY IN ROAD TRANSPORT SECTOR</u> To assess the current levels of fuel efficiency in the diesel-powered commercial transport plying in the country to ascertain the extent to which the usage of fuel falls short of the optimum/preferred levels of efficient use.
09.	<u>SELF-REGULATION TO CONTROL OVER-LOADING OF TRUCKS BY TRUCKING INDUSTRY IN THE COUNTRY</u> Proper implementation of Weight Control Legislation and other regulations framed for discouraging overloading through self-regulation by trucking industry so as to achieve fuel efficiency and facilitate environmental protection.
10.	<u>ANALYSIS OF OPERATING COSTS OF CARGO TRUCKS IN THE PRIVATE SECTOR</u> Highlight the excessive costs incurred due to overloading, prepare achievable action plan for policy makers and fleet owners to eliminate/reduce the overloading practices, and prepare awareness campaign targeted at truckers/owners.
11.	<u>IMPLEMENTATION OF NATIONAL HIGHWAY SAFETY ORDINANCE 2000 AND ITS TICKETTING SYSTEM FOR TRAFFIC VIOLATIONS</u> Capture the snap shot of the current status with respect to the implementation of the Ordinance, analyse the current status, and formulate recommendations/ suggestions to accomplish complete enforcement of the Ordinance.
12.	<u>ENERGY EFFICIENCY AND ACTIVITIES OF OTHER ORGANIZATIONS, SPECIALLY IN ROAD TRANSPORT SECTOR OF THE COUNTRY</u> Collection and compilation of information regarding activities related to energy efficiency, especially in the road transport sector, and development of database.
13.	<u>CONVERSION OF DIESEL VEHICLES TO CNG AND RELATED ISSUES</u> Analysis of the ground realities regarding the conversion of diesel vehicles to CNG, and identification of incentives, policy recommendations and appropriate steps that will be essential for promoting the conversion of diesel vehicles to CNG in Pakistan.
14.	<u>MODAL SHIFT IN FAVOR OF HCVS (HIGH CAPACITY VEHICLES)</u> Develop a policy package to ensure sustainable urban bus services in major cities of the country.
15.	<u>STANDARDIZATION OF QUALITY OF AUTOMOTIVE LUBRICANTS</u> Formulate policy interventions to standardize the quality of both fresh and reclaimed auto lubricants to achieve fuel efficiency, protect environment from undesirable emissions and gain economic/financial benefits

16. [TRAINING NEED ASSESSMENT FOR CNG CONVERSIONS](#)
Promotion of proper installation of CNG conversion kits, and their proper tune-up and maintenance for accomplishing best possible fuel efficiency.
17. [TO DETERMINE EFFECT OF CANOPY ON FUEL EFFICIENCY OF TRUCKS](#)
Investigate ground realities, and identify/quantify the fuel in-efficiency resulting because of canopy (crown/ taj) commonly employed by trucks in the country.
18. [INTRODUCING FUEL CELL TECHNOLOGY IN THE COUNTRY](#)
To appraise the viability and scope of introduction and use of the fuel cell technology in the country, and formulate and implement a pilot project to demonstrate the fuel cell technology.

Annex 5 Project Partners

Private Sector	Suzuki Motorcycles Suzuki Azim Motors (Islamabad) Toyota Southern Motors (Karachi) Fikri Automotive (Karachi) MESEC (Karachi) Royal Dutch Shell Oil Caltex British Petroleum Pakistan Unipak Securities City Motors (Abbotabad) Fiat Motors (Sailkot)
NGOs & Training Organizations	ARUP (Islamabad) WWF (Islamabad) National Institute of Science and Technical Education Skill Development Council (Peshawar) Government Apprentices Training Center (Faisalabad) Government Technical Training Institute (Multan) Vocational Training Institute (Lahore)
Government	University of Agriculture (Faisalabad) Dept of Engineering Ministry of Environment, Local Government and Rural Development Ministry of Finance Ministry of Industries and Production (Small and Medium Enterprises Development Authority) Environmental Protection Agencies (Federal & State) Pakistan State Oil Company
Donors	United Nations Development Program Global Environment Facility
Consultants	Arch Vision Consulting Engineers Metro Consulting Mascon Associates

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Annex 6 Stakeholders Consulted

Name	Representation
Lena Lindberg	UNDP Pakistan Deputy Resident Representative
Abdul Qadir Rafiq	UNDP Pakistan Program Officer (Environment Unit)
Dr. Sarwar Saqib	UNDP FERTS Project Manager
Iftikhar Raja	UNDP FERTS Planning and Evaluation Officer
Shahrukh Pracha	UNDP FERTS Project Administrator
Colonel Jalil Ahmed	UNDP FERTS Manager Gasoline
Colonel Naeem Bari Salimi	UNDP FERTS Manager Diesel
Naseem Anwar Khan	UNDP FERTS Manager Special Studies
K.M. Zubair	ENERCON Managing Director
Fatima Azim	Suzuki Azim Motors (Islamabad) Managing Director
Usman Ali Khan	Suzuki Azim Motors (Islamabad) Director of Operations
Midhat Azim Kidwai	Suzuki Motorcycles (Karachi) Chairman and Chief Executive Officer
Hassan Ali Fadool	Toyota Southern Motors (Karachi) Director
Ali Fadool	Toyota Southern Motors (Karachi) Director
Munawwar Quraeshi	Toyota Southern Motors (Karachi) Manager Planning and Business Development
Irfan Raza Fadool	Toyota Southern Motors (Karachi) Director Servicing Department
Commander Asif Khawaja	ARUP Executive Board Member
Muhammad Sarwar	MESEC Pakistan Chief Executive
Zia Sami	Sohrab Motor cycles (Karachi)
Adnan Maqsood	DENSO Pakistan Motors (Karachi)
Ovais Ahmed Kohari	Ovais Motors (Karachi)
Dr. Muhammad Razi Masood	Uaquat National Hospital (Karachi) Senior Manager Emergency Medicine
Sharjeel Shakbel	Workshop owner (Karachi)
Ussama Zia	Workshop owner (Karachi)
Patrick Adeel	Bano Welfare Trust
Malik Munir	Nazir Automobiles (Islamabad)
Professor Jehangir Khan Sial	University of Faisalabad
Farida Essa	Arch Vision Consultant Engineers
Chaudhary Laiq Ali	Metro Consulting Group
Yousaf Abidi	Mascon Associates
Rizwan Abidi	Mascon Associates
Asif Khan	Environment Protection Agency Director General
Anjum Ahmad	Small and Medium Enterprise Development Authority: General Manager
Dr. Richard Hosier	PTA, UNDP/GEF Climate Change Unit, New York
Olav Lundstol	Portfolio Manager, Climate Change, Regional Coordination Unit, UNDP/GEF Asia and the Pacific, Kuala Lumpur, Malaysia.

Annex 7 Presentations

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Suzuki Motor cycles (2004) Two Stroke versus Four Stroke.

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UNDP FERTS (2004) Identification of Departments for Emission Standards Implementation

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UNDP FERTS (2004) Brief on FERTS to Local Benefits Study Mission

UNDP FERTS (2004) Awards Procedures for FERTS Special Studies

UNDP FERTS (2004) Assessment of Current Levels of Fuel Efficiency in the Road Transport Sector