



GREEN FLEET MANAGEMENT

Implementation guidebook for organizations in UAE

Eng. Faisal Rashid, PMP
DSCE DSM Director

Eng. Luka Lugaric, PMP
DSCE DSM Project Manager

Dubai, February 2018

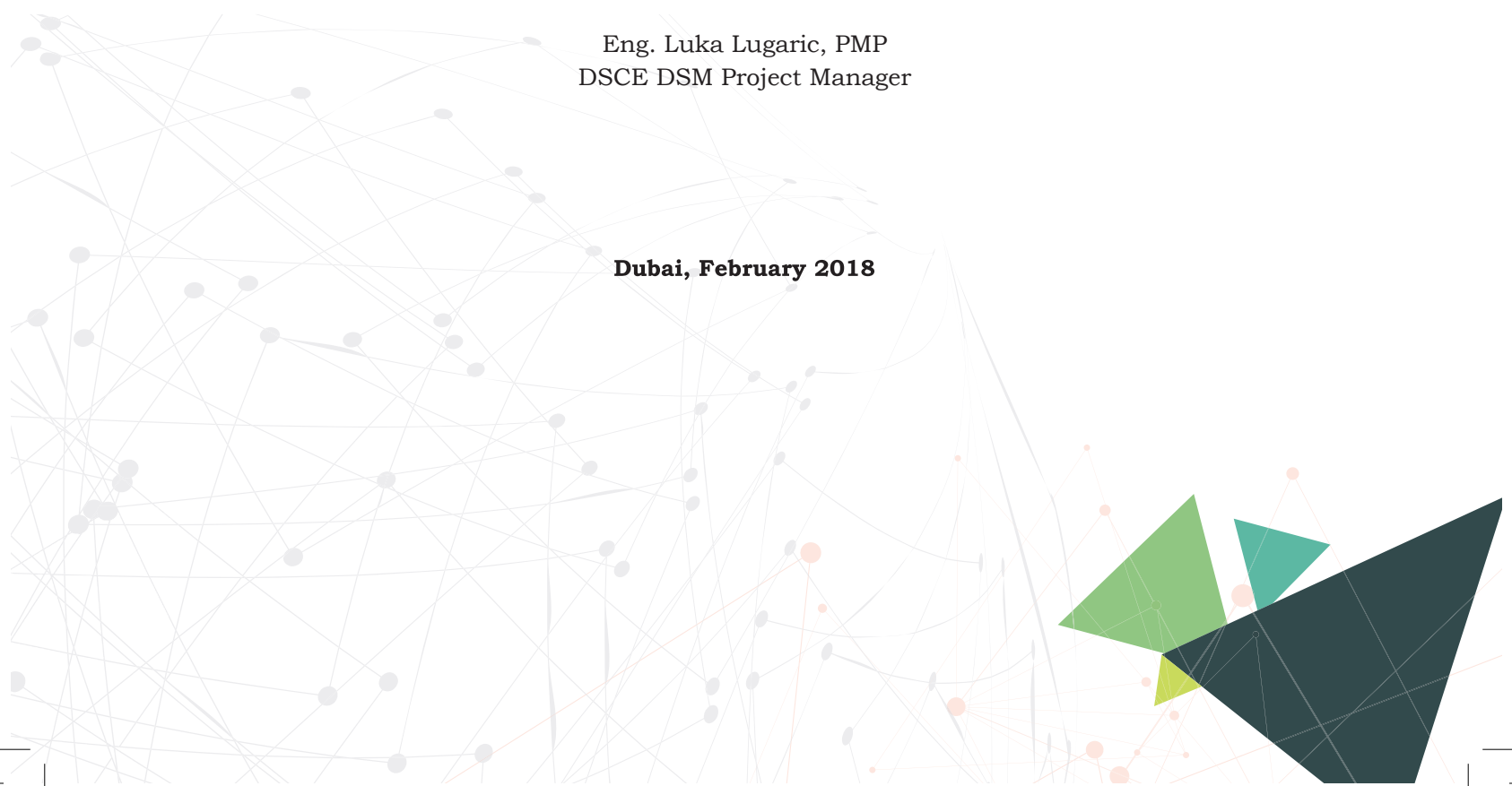


Table of contents

Purpose and target audience of this guide	2
About the authors	3
Acknowledgements.....	3
1. Introduction to green fleet management	4
1.1. Definition of green fleet management	4
1.2. Green fleet management strategy.....	5
1.3. Role of a fleet manager	7
1.4. Fuel and Engine efficiency standards for light and heavy-duty vehicles	9
2. Developing a green fleet management system	12
3. Thinking framework on key steps of green fleet management.....	23
3.1. Working with people.....	23
3.2. Creating supporting structures and performance measurement framework	23
3.3. Reducing wasted mileage.....	25
3.4. Grey fleet management.....	26
3.5. Procurement of a vehicle	27
3.6. Managing mileage and fuel	28
3.7. Telematics – insurance and other uses	33
3.8. Maintaining the Green Fleet	34
3.9. End-Of-Life Vehicle Disposal	36
4. Overview of vehicle and fuel technologies	37
4.1. Latest technology petrol and diesel vehicles	37
4.2. Electric and hybrid vehicles.....	38
4.3. Gas vehicles	40
4.4. Biofuels	41
4.5. Comparing the technologies.....	42
4.6. Future technologies and thinking	43
5. Choosing a fleet.....	45
5.1. Assessing the options	45
5.2. Defining requirements	46
5.3. Assessing the costs	47
5.4. Ranking the solutions	47
5.5. Incentives to help make the switch	48
6. Implementation tips & questions to consider	49
6.1. Fleet management tips	49
6.2. Driving Tips	50
6.3. Questions to consider when thinking about green fleets	51
7. Summary and conclusion	52
Appendix: Understanding the global context for green fleets	53
Climate change and transport.....	53
Transportation emissions and environmental health	55
United Arab Emirates and Dubai	57
Rationale for focusing on fleets	60

Purpose and target audience of this guide

Transport or transportation is the movement of people and goods from one location to another. It is a critical support system for the smooth functioning of our society and economy. Transport facilitates accessibility of services that are vital for business and for the quality of life of citizens. It also enables economic growth and job creation. Transport systems exist to provide social and economic connections, and people quickly take up the opportunities offered by increased mobility. The advantages of increased mobility need to be weighed against the environmental, social and economic costs that transport systems pose.

The main purpose of this guide is to help organizations in Dubai, UAE and beyond to implement the concept of “green fleet management” and associated concepts related to sustainability in transport. By doing so, organizations can improve their operational efficiency, environmental performance and demonstrate a high level of corporate social responsibility. We also take into account recent government initiatives aimed at diversification of fuels used for transport, such as the promotion of electric and hybrid vehicles (Green Mobility Initiative), considerations on CNG and in general the policy direction towards more stringent fuel efficiency standards.

This guide is intended for those individuals, managers/directors or heads of department who are responsible or in charge of managing organizations transport fleet. It is also intended for all interested readers who have financial cost control over the vehicle fleet in their organizations, whether in government entities or commercial institutes. The guide will help to incorporate green land fleet management principles and values into an organization transport scheme and make them understand how a range of relative measures fit together to deliver a better end result in both fleet cost saving and environmental improvement.

We structured the guide to present the reader with a thought process as well as technical issues associated with green fleet management. In doing so, we focus on commercial viability of project of introducing green fleets, which are positive not just for the bottom line, but have a broader positive effect on the environment, by reducing pollution.

For those who are interested in the broader context around this topic, in the Appendix we include a broader overview of global challenges connected to which green fleet management.

About the authors



Faisal Ali Rashid, a UAE National, received his B.Sc. degree in Mechanical Engineering from Dayton, Ohio University in 1991, London School of Economics energy public policy making certificate from 2016 and is a certified Project Management Professional (PMP).

Has a wide experience in energy management, industrial plant processes across multiple industries including oil & gas, power & water generation and glass manufacturing.

His current role as the Demand Side Management Director in Dubai Supreme Council of Energy includes looking after the strategy and policy on energy efficiency and sustainability for all of Dubai.



Luka Lugaric received his M.Sc degree in electrical engineering from University of Zagreb, Croatia in 2007 and is a student at University of Cambridge, United Kingdom for a M.St. degree in Sustainability Leadership. He holds a project management professional (PMP) certificate and has 10 years of experience in developing and implementing projects in academia, government and private sectors.

He is currently a project manager at Dubai Supreme Council of Energy, directly contributing to development of strategies and policies for a sustainable energy future of Dubai.

Acknowledgements

The authors would like to thank reviewers of the drafts of these guidelines:

- Mr. Graeme Sims, Executive Director, RSB Dubai
- Mr. Ahmed Siddiqi, Sr. Manager, DEWA
- Mrs. Nadia Bin Lootah, Sr.Exec, DEWA
- Dr. Sami Ibrahim, Sr. Manager, RTA
- Mr. Stephane LeGentil, CEO, Clean Energy Business Council

1. Introduction to green fleet management

In today's modern world, vehicle fleets can come in many different shapes and sizes. Technically speaking, both a large, internationally operating trucking company and a small, locally operating delivery company are considered fleets. So, if you fall into either of these categories or anywhere in between, you have a fleet to run. Regardless of the size and operating procedures of your fleet, you need a comprehensive fleet management program to keep your fleet running as efficiently as possible.

At its core, fleet management covers the practices of overseeing, organizing, and recording all aspects of an organization's fleet. These managerial duties might include, but are not limited to, establishing regular vehicle maintenance schedules, establishing cost-saving measures, and implementing new driver training programs. **Depending on your company's size and the industry in which you operate, how large and varied your fleet is, fleet management practices vary more as the aspect of management grows more specific.**

This guidebook helps in familiarizing the designated "fleet manager", or equivalent, and guide him/her through the basics of fleet management and building of the company's own successful fleet management program from the ground up.

1.1. Definition of green fleet management

"Green fleet management", as a term, is a combination of concepts of fleet management, integrating with concepts of green vehicles and sustainable transport as explained further below.

Having in mind that "green" is a common euphemism for "sustainable", we will use "Sustainable fleet management" and "green fleet management" interchangeably, as they have the same meaning.

Fleet (vehicle) management can include a range of functions, such as vehicle financing, vehicle maintenance, vehicle telematics (tracking and diagnostics), driver management, speed management, fuel management and health and safety management. Fleet Management is a function which allows companies which rely on transportation in business to remove or minimize the risks associated with vehicle investment, improving efficiency, productivity and reducing their overall transportation and staff costs, providing 100% compliance with government legislation (duty of care) and much more. Either an in-house fleet-management

department or an outsourced fleet-management provider can deal with these functions.

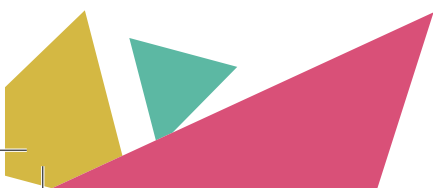
A green vehicle, or clean vehicle, or eco-friendly vehicle or environmentally-friendly vehicle is a road motor vehicle that produces less harmful impacts to the environment than comparable conventional internal combustion engine vehicles running on gasoline/petrol or diesel, or one that uses certain alternative fuels. Presently, in some countries, the term is used for any vehicle complying or surpassing the more stringent European emission standards (such as Euro6), or California's zero-emissions vehicle standards (such as ZEV, ULEV, SULEV, PZEV), or the low-carbon fuel standards enacted in several countries.

Sustainable transport refers to the broad subject of transport that is sustainable in the senses of social, environmental and climate impacts and the ability to, in the global scope, supply the source energy indefinitely. Components for evaluating sustainability include the particular vehicles used for road, water or air transport; the source of energy; and the infrastructure used to accommodate the transport. Short-term activity often promotes incremental improvement in fuel efficiency and vehicle emissions controls while long-term goals include migrating transportation from fossil-based energy to other alternatives such as renewable energy and use of other renewable resources. The entire life cycle of transport systems is subject to sustainability measurement and optimization. Sustainable transport systems make a positive contribution to the environmental, social and economic sustainability of the communities they serve.

In conclusion, green fleet management brings together the above three definitions and is defined for the purposes of this book as a set of activities with the purpose of transforming any existing organization vehicle fleet into a managed system oriented towards green living and sustainability.

1.2. Green fleet management strategy

A green fleet management strategy aims to reduce environmental impacts through a combination of cleaner vehicles and fuels, fuel-efficient operation and driving; and by reducing the amount of road traffic it generates. In doing so, the fleet minimizes fuel and vehicle costs and improves the safety and the welfare of employees while reducing its exposure to the problems of congestion. The strategy will also help to meet the requirements of other policies within the organization; for example, business



efficiency, health and safety, equalities and inclusion, and corporate social responsibility (CSR).

A green fleet management strategy is based on three key types of measure:

1. **Transport demand management** – aims to reduce the kilometers driven. Look at whether trips are necessary, and consider if they can be combined and whether the optimum routes are being used, whether a trip can be replaced by video conference, whether a trip is nearby and it can be replaced by walking etc. By examining current practices, significant mileage savings can be made, thereby reducing fuel and mileage costs, emissions and even the size of a fleet
2. **Cleaner fuels and technologies** – aim to use the lowest emission vehicles appropriate to their role. With existing diesel and petrol vehicles, use the smallest, most efficient vehicle appropriate for the job. Explore new, low-emission technologies such as electric vehicles (EVs) or sustainably produced biofuels that may be suitable
3. **Efficient vehicle use** – ensure that vehicles are being used as efficiently as possible and using the least amount of fuel. The key areas here are driver performance and vehicle maintenance, as both have a significant impact on fuel. Reducing fuel use will cut emissions and running costs

Central to sustainable fleet management is the principle that ‘you can’t manage what you don’t measure’. The different measures are all based upon ongoing monitoring and target setting to ensure that performance is assessed and continuously improved, as illustrated in Figure 2.



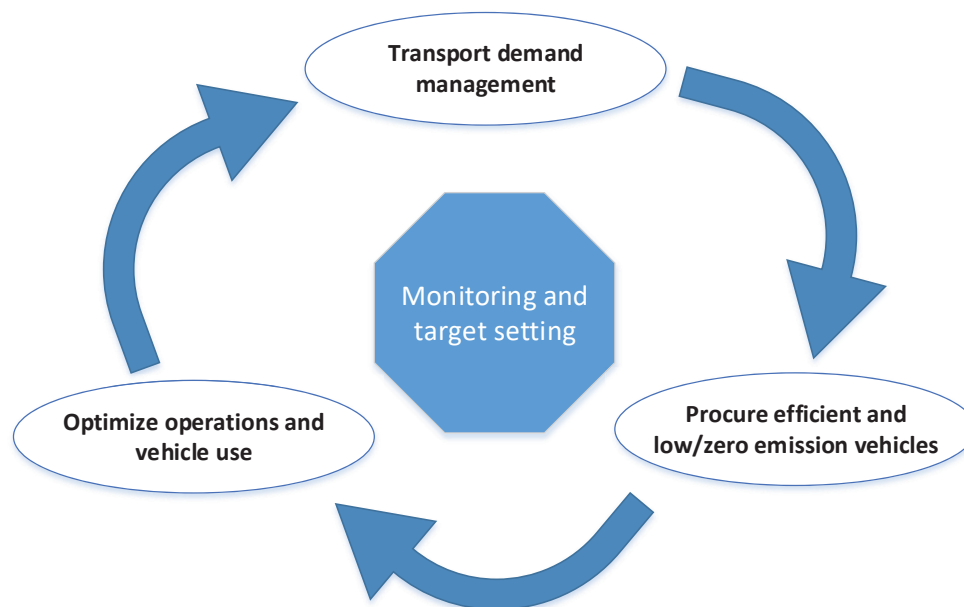


Figure 1 – Transport demand management

1.3. Role of a fleet manager

Decisions on an organization's fleet and/or managing a project of transforming the fleet into a green fleet should be part-time or preferably full-time responsibility of at least one person depending on the size of an organization, which has authority to make decisions and take action about the vehicle fleet of the organization.

The fleet managers are responsible for selecting and maintaining vehicles in order to keep deliveries and distributions on schedule and within its established budget. In order to succeed, fleet managers need significant experience and skills in operations, logistics and using software programs to monitor both fleets and drivers. In a logistics company or a transportation company, fleet managers play a pivotal role. The fleet managers are responsible for selecting and maintaining vehicles in order to keep deliveries and distributions on schedule and within its established budget. In order to succeed, fleet managers need significant experience and skills in operations, logistics and using software programs to monitor both fleets and drivers.

A fleet manager has many primary responsibilities to keep in mind when establishing the organization's green fleet management program. The following requirements serve as a guideline on the development of the job description that should cover the whole process of fleet management, from training drivers to acquiring vehicles:

- **Selecting Vehicles** - The fleet managers make decisions about what kind of vehicles to purchase and how many. Some companies buy vehicles outright, others will lease vehicles to meet the company's needs from an economic perspective. When the vehicle is no longer useful for the fleet, the manager will then market and resell it to get back as much as the company's investment as possible.
- **Record Keeping** - Fleet managers are responsible for impeccable records. They both register and license all vehicles and keep inspections up to date. They keep records to prove that the fleet company complies with all state and federal regulations.
- **Maintenance** - In order for transportation companies to work properly and make the necessary profits, vehicles need to be maintained at peak operating conditions. Fleet managers set up schedules to ensure each vehicle is kept in top condition. Larger companies will have their own in-house service centers with mechanics and specialists to handle maintenance. Smaller companies will have to outsource maintenance and repairs to outside shops. Strict schedules make sure that the optimum amount of vehicles are working at all times to meet customer needs. It also helps minimize costs by maximizing fuel efficiency and minimizing unexpected repairs.
- **Driver Management** - Fleet managers need excellent people and communication skills to do their jobs well. Reliable drivers are essential to keep a company profitable. Inefficient drivers can be a problem, causing fines, lawsuits with erratic driving or tickets from speeding. Many fleet managers use GPS trackers on the entire fleet to monitor locations of the vehicles and drivers' habits. On top of all that, the person in charge must provide training for all drivers on sustainable driving.
- **Profit & Loss** - Fleet managers are also important in keeping down costs, fuel consumption and impact of the two on maximizing profits. Most rely on accounting software to record and collect data. Managers will look for patterns to see areas where they can cut expenses and reduce administrative costs.
- **Education and Training** - To become a fleet manager, one will likely need an associate's degree or credential certificate and several years' experience in the transportation industry. You will need to be familiar and proficient with the industry's green and economic concepts, practices and procedures. A bachelor's degree in logistics or accounting can be especially useful as you move up within the company, institute or authority.

In the past five years, the need for fleet managers has risen a great deal. For the next ten years, it is expected to continue to grow, so the job outlook is quite good. Many transportation companies are in need of fleet managers and compete vigorously for a narrow talent pool, so many experienced fleet managers can command above-average wages.

1.4. Fuel and Engine efficiency standards for light and heavy-duty vehicles

To accelerate deployment of the more fuel-efficient vehicle engine and other technologies, governments in developed nations have introduced a variety of policies such as voluntary targets and regulatory standard programs. Some developed countries have over 30 years of experience with policies to improve vehicle fuel efficiency. The scope of policies is vast, ranging from a hands-off approach to voluntary programs to strict mandatory regulations. In light of this, European Union, Canada, Japan and South Korea, Japan, and others have all moved from voluntary to regulatory regimes in recent years.

Studies and the subsequent energy efficiency recommendations by these nations called for the introduction of regulatory fuel economy standards, which are as stringent as possible, appropriate to each country. It was noted that the design of fuel economy standards determines the outcome of the policy and its effectiveness and efficiency. Several issues, such as the scope, test procedures required, flexibility, and administrative costs, are also important. The countries jointly recommended the introduction of fuel/engine efficiency standards for light and heavy-duty vehicles. A common finding is that countries without fuel/engine efficiency standards should introduce them immediately and those with existing standards assess whether the level of the standards should be more stringent. Any new standards should be announced as soon as possible to allow industry time to adapt product development.

Governments should harmonize as many aspects of fuel/engine efficiency standards as possible across countries. This will enable comparison of targets between countries and reduce industry costs while keeping costs to car manufacturers at lowest levels (as a car produced for one national market is acceptable in multiple others). Although vehicle labeling is usually not listed as a recommendation on the measures, it is an important complementary measure to fuel economy standards.

In light of the above, when properly implemented, vehicle fuel consumption standards can yield significant improvements in the fuel efficiency and GHG emissions performance of common vehicle models.

Notably, an advance on vehicle efficiency programs has been registered at the **regional level in the GCC**. GCC Standard Organization (GSO) developed and adopted a technical regulation titled “GSO No 42/2015: General Requirements – Motor Vehicles” in 2015 which will be enforced in the 2018 year models and onwards, aimed at ensuring high levels of vehicle safety, energy efficiency, anti-theft protection and environmental protection. The regulation defines requirements that all vehicle manufacturers must conform to, for passenger cars and light trucks in the GCC market. A specific provision is on the Fuel Consumption Measurement and Label, mandating all vehicles with weight equal to or less than 3500 kilograms to carry a label on fuel consumption efficiency, prescribing the minimum details the label should include.

On the level of UAE, in 2016 Emirates Authority for Standardization & Metrology (ESMA) garnered significant publicity for a wide variety of initiatives, particularly in the motor vehicles sector. In March 2016, ESMA announced that it was in the final stage of developing regulations related to the importation of used motor vehicles. In February 2016, UAE established regulations mandating fuel efficiency ratings for motor vehicles beginning with 2017 models. This initiative was followed by the implementation of fuel efficiency and wet grip ratings for tires manufactured and/or sold in the country, also starting at the beginning of 2017. In addition to this, the authority laid down a new draft standard for a vehicle’s fuel economy. In July 2016, UAE minimum specifications for electric vehicles came into effect, defining requirements particularly in relation to the adaptability of these vehicles to local weather conditions.

UAE recently completed a standard for fuel efficiency, based on a technical assessment undertaken by the Ecological Footprint Initiative, a federal-level cross-sectoral partnership, in order to provide the scientific basis for the policy. The proposed CAFE (Corporate Average Fuel Economy) standard sets annual average sales-weighted fuel economy targets for each manufacturers up to 2028, with the potential to improve UAE fleet’s fuel efficiency from the current average of 12.1 km/l to 20.8 km/l by 2028, resulting in massive savings fuel and carbon emissions in the long run.

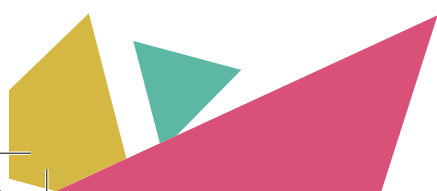
All vehicles from 2017 model-year entering the UAE will be rated according to their fuel-efficiency levels, according to the Emirates Standardization and Metrology Authority (ESMA). All manufacturers and importers have already been informed about

the new rating system. All vehicles will be categorized according to six rating levels, the more efficient the vehicle, the higher the rating will be:

- Excellent – 14.70 km/liter or higher
- Very good – 14.20 to 14.69 km/liter
- Good – 13.60 to 14.19 km/liter
- Average – 13.0 to 13.59 km/liter
- Poor – 12.50 – 12.99 km/liter
- Very Poor – 12.49 km/liter and below

This is part of the efforts to improve the environment and promote eco-friendly vehicles, while also giving consumers a better idea of how fuel-efficient their choice of car is before they purchase it. Passenger cars and light-duty commercial vehicles with a maximum weight of 3,500 kg will be the first to get the labels, which will be installed in the rear left-hand-side window of the vehicles by the manufacturer. The labels look similar to the ones already found on refrigerators and air-conditioners in the UAE. The next stage will see heavy vehicles coming under review with a different set of ratings.

This system is identical to the “SASO” ratings already in place at Saudi Arabia dealerships, following GSO standards, and might soon be implemented GCC-wide. GSO is the regional standardization body for the GCC, based in Saudi Arabia.



2. Developing a green fleet management system

There is a multitude of literature available online and offline on fleet management, green fleets, and sustainability in transport. In developing this book, authors studied a number of publications and discovered two main trains of thought – one is about the process of developing the idea ending with the monitoring **stages**, and the other is about several **key concepts** on the fleet development and how to perform them best. For purposes of this guideline, we wanted to illustrate both – the 6 stages, along with a thinking framework that can be kept in mind throughout the 6 stages, containing key concepts. The matrix created by this thinking is shown in Figure 3.

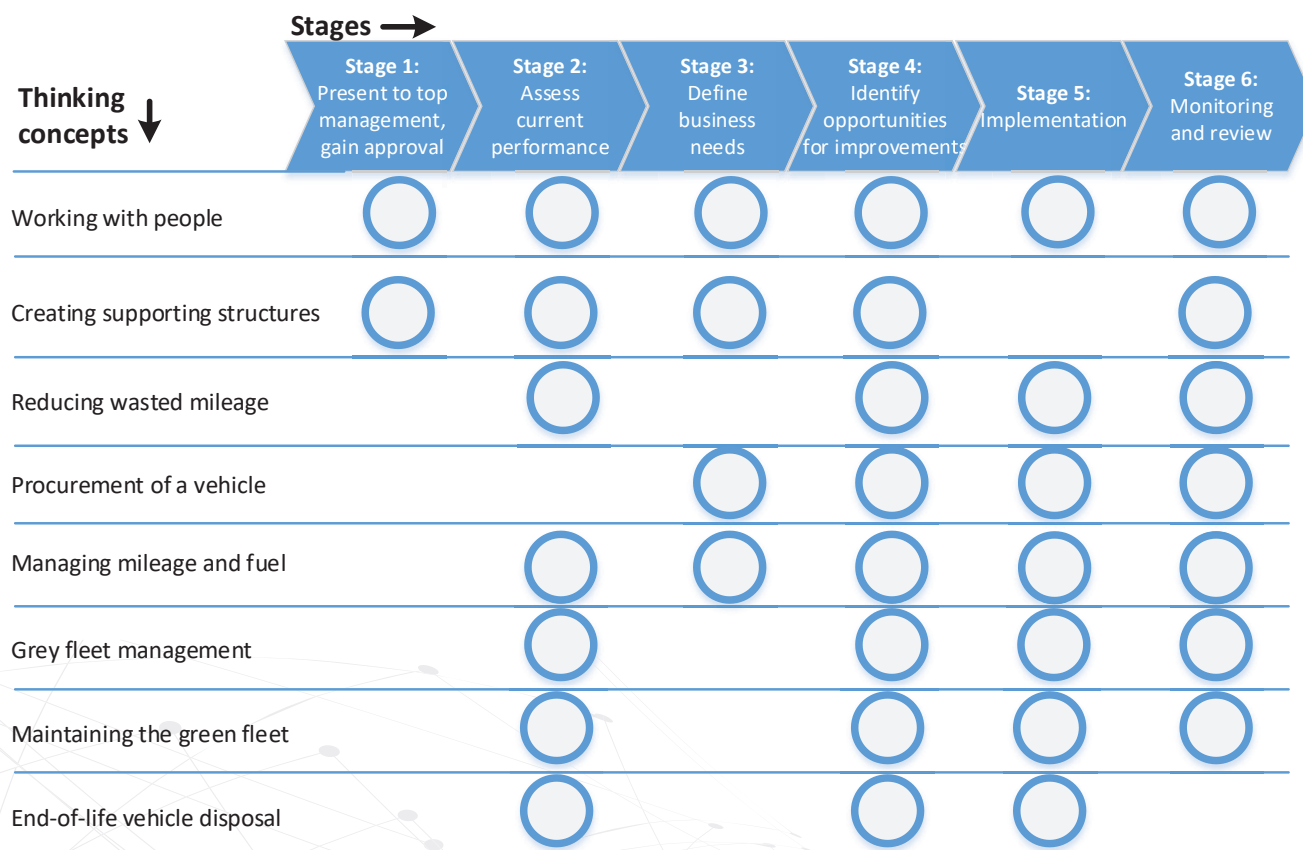


Figure 2 - Green fleet management - thinking matrix

We will go into more detail on each concept and stage in the following chapters. One concept perhaps previously unfamiliar to the reader is “grey fleet management” – this is simply the term used to describe any vehicles that do not belong to the company, but which are used by employees for business-related travel, and thus fall under the responsibility of the employer.

Overview

Just like any change in an organization, top management decision on committing to the development of a green fleet management system is crucial to the success of the initiative. There is a number of reasons why organizations need to adopt green fleet management processes into their policies, procedures, and practices, there will be the direct positive impact on commercial, environmental and safety aspects of the fleet, as was discussed before.

Sustainable fleet management has implications for many areas of business management, for example:

- Vehicle procurement and specification
- Business travel policies
- Company car allocation policies
- Health, safety, and environmental policies
- Logistics management
- Supply chain management and distribution
- Management and scheduling of sales staff, service calls etc.

Therefore, a systematic approach is critical to ensure proper steps are taken towards a successful result. The overall process is shown in Figure 4.



Figure 3 – Green fleet management introduction, process overview

Stage 1 Present to top management and gain approval

On the operational level, management is concerned with optimizing and controlling the use of company resources to achieve specified objectives. The most important resources are knowledgeable, experienced and resourceful people and company capabilities and awareness on how to perform – the ‘know-how’. Therefore, management process is not only task oriented but also, and even more important – people oriented. Effective management process must be based on data analysis and information from a business system. Management by facts is a management concept that should prevail rather than a concept of management by opinion. Key objective of any management process is to manage various aspects of a company’s performance. Input for a management process is information and the outputs are decisions. This concept is illustrated in Figure 5.

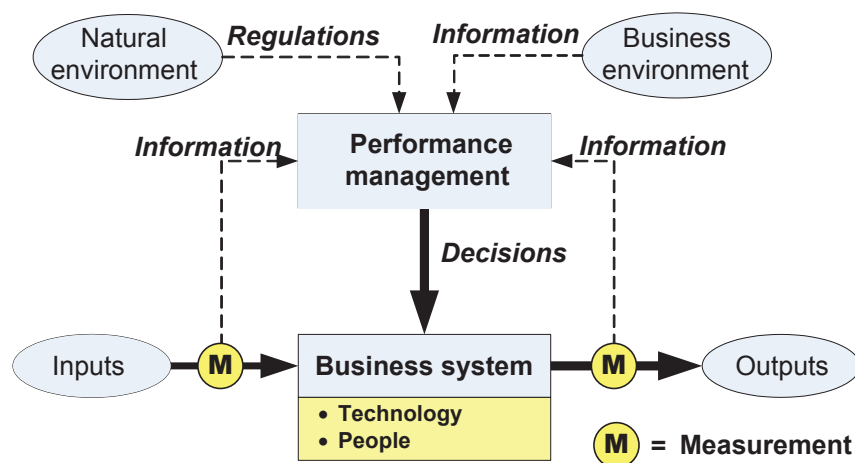


Figure 4 - Overview of performance management process

In order to succeed, Green Fleet Management (GFM) project must have champion(s) or leader(s) who will understand this setting and relentlessly pursue opportunities for energy and environmental performance improvements – in this case focusing but not limited to the organization’s transportation resources and processes. These individuals must be true believers in needs and possibilities for performance improvement and must have sufficient personal and professional authority to be respected, listened to, and followed by as leaders. People at every organizational level are change agents who, when properly empowered, inspired and guided, come alive with vitality, intelligence, and exceptional profitability potential that can make or break a success of GFM project.

Let us consider how we can gradually move forward starting first with top management and key decision makers.

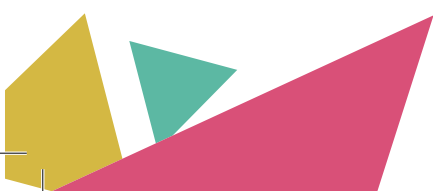
Every change process is painful enough even if all the stakeholders are fully motivated. For a subject such as green fleet management, which does not immediately strike as the highest priority, this is even more important. The first task is to present the challenges as important to higher management and to establish it as a relevant topic for top management of the organization.

If the vision and commitment of top management cannot be achieved during the project start-up, the activity is destined to fail. In order to achieve top management support, suitable arguments and adequate presentation have to be prepared by internal or external key actors. **The argumentation for green fleet management as a relevant and positive contribution to business performance has to combine pure economic consideration with additional benefits, focusing on the company's multi-dimensional aspects of competitiveness, such as cost reduction, environmental compliance, improved quality, 'green' image, etc.**

As said earlier, energy is used everywhere and by everyone in a company and every individual's behavior affects the environmental performance, so any project impacting company's energy use, including fleets, must involve everyone in order to give the best results. Consequently, all employees must be mobilized to assume adequate responsibility based on their position within the organization. It can be achieved only if employees are convinced that green fleet management is really a matter of high importance to the company.

That is another reason why top managements' visible commitment to green fleet management is important. If there is no visible commitment at the top, it is highly unlikely that there will be any thought of change on lower levels of the company's hierarchy. To successfully implement a sustainable fleet management review and strategy, high-level business support is essential. This can be achieved by developing the business case and explaining how the review and resulting measures can achieve corporate objectives. These benefits include:

- Reduced operating costs gained through a reduction in kilometers, vehicle operating costs and improved employee productivity, all leading to a better bottom line – profit for the company



- Delivering carbon reduction and other environmental impacts, alleviating the reliance on fossil fuels, improving business resilience, improving organizational accessibility to new workforce and fostering good CSR
- Enhancing the organization's image and environmental management credentials which can result in increased sales and improved contract tendering process; improving financial reporting processes; and environmental reporting of CO2 impact to clients and supply chain

Much of sustainable fleet management is simply good business practice. When properly implemented, it improves asset management so it can be justified on its own commercial merits. Improving fleet performance on purely commercial or cost efficiency grounds usually involves better fuel economy and lower emissions, so the environmental gains are a bonus.

In many cases, environmental factors can form the ideal stimulus to review a fleet policy and examine the improvements that can be made.

Irrespective of the size of the organization, establishing competent policy & strategy to manage business fleet makes a lot of commercial sense today. In view of that, management commitment and pledge are considered vital to the success of the whole fuel abatement and overall green fleet management. Likewise, the senior management in charge must be willing to take the necessary measures on the following:

- Adopting the green fleet strategy and policy to manage all vehicles and their associated fuel consumption.
- Create a platform and budget to educate drivers and employees on a continuous basis.
- Support usage of latest technology like fleet management system to measure, record, track fleet performances and evaluate fuel usage.
- Explore usage of alternative cleaner fuel to comply with social and environmental benefits.
- Adopt good best vehicle maintenance practices to cut down repair cost.
- Keep and maintain all historical& real-time maintenance record of vehicles in a file.
- Adopt periodical fleet reporting and information distribution system to stay intact.
- Adopt competent green procurement policy for fleet including purchasing, writing off and disposal.
- Avail annual budget to support green and efficient fleet.

- Select most economical method through either leasing or purchasing of the vehicle to manage the fleet.
- Create fuel efficiency data logbook for respective departments.
- Agreeing on fuel efficiency target to be reached for the respective departments.
- Create a mechanism to monitor fuel consumption.
- Provide clear guidelines on when a company or private cars can be used for official work.

Once senior management has supported the program and announced it to all employees, this will enable the fleet manager to formulate an appropriate strategy for review and later a communications plan for engagement with the wider workforce. This engagement, whether one-on-one or within focus groups will enable you to deliver a solution that is practical and fit for purpose.

Stage 2 Assessing current performance

The first stage in developing the strategy is to gain an understanding of current fleet operations and costs, existing business policies and processes, ensuring that there is sufficient and appropriate data to develop an informed green fleet strategy.

The green fleet management checklist we provide below provides a simple template to go through the process of information gathering under the following areas:

- What are the existing fleet policies of the organization?
- What monitoring is being done?
- What measures are undertaken to minimize vehicle mileage?
- What is done to encourage fuel-efficient vehicle use?
- What is done to ensure use of the cleanest and most efficient vehicles and fuels?

The checklist below poses a number of questions on corporate policies and the information used to monitor fleet performance. Examples are given of how these might be answered, and space is provided for recording of your own assessment. Working through the checklist can help identify those actions that are already being taken and potential opportunities for further improvement.

Table 1 - Sustainable fleet management checklist

Business policies.	Example
Is there an approved environmental fleet policy?	This might be part of the corporate environmental policy.
Is there an approved health and safety policy that covers fleet vehicles and use of private vehicles?	Could include standard checks on licenses and insurance together with frequency of checks, defensive driver training and restrictions on gray fleet use
Is environmental reporting being carried out?	ISO 14001, Scope 3 carbon emission reporting
Are there any other sustainable transport policies or strategies?	A workplace travel plan, business travel strategy, or delivery and servicing plan
Fleet performance monitoring.	Example
Are fuel expenditures of the organization known?	Fuel card invoices
Are vehicle and business mileage monitored?	Vehicle mileage through service reports, business mileage through mileage claims
Is fuel economy monitored for each vehicle?	Analysis of fuel card data
Are mileage and fuel economy set as performance targets?	Comparing recorded kilometers per gallon with averages and manufacturers measurements.
Mileage reduction.	Example
Is trip planning or routing software used?	Scheduling systems can greatly reduce wasted mileage while providing better journey time predictability and ability to respond to unexpected disruption.
Are there incentives for walking, car sharing, cycling and using public transport for business trips?	For example, a passenger rate for cars and a cycle mileage rate
Is video and audio conferencing used for business meetings?	This could be part of a sustainable business travel strategy
Are vehicle telematics used to monitor and track vehicles?	This can both help with fuel and mileage monitoring – and improve vehicle scheduling and planning for traffic disruption.
Efficient vehicle use.	Example
Is there a driver handbook with advice on how to save fuel?	Many online examples of fuel-efficient driving

Is smarter driver training (or eco-driving) provided for staff?	
Are feedback and incentives provided for good driver performance?	Bulletin boards with top lists of drivers and their km per gallon on average
Do you use a scheduled service and maintenance plan for your vehicles?	A pre-set plan for scheduled service or a contract with external service provider for periodical maintenance of vehicles
Is there a vehicle checklist for drivers?	A daily list of checks for the driver to do on a vehicle before starting use, and before returning the vehicle at end of daily use.
Clean fuels and technologies	Example
Is the most fuel efficient and/or smallest vehicle fit for the purpose used?	Using lists based on CO2 and whole life costing
Are relevant emission standards and CO2 levels included in vehicle specifications?	Varies depending on country, for UAE fuel efficiency standards with company policy driving towards more efficient cars as per standard
Is there a process to incentivize those who use their own car for business to use low CO2 or alternative fuel cars?	Company negotiating discounts for employees, providing monetary incentives for purchases (i.e. to cover price difference) or additional days off
Are there alternative fuel vehicles such as electric or gas in your fleet?	Purchasing a number of electric or LNG/CNG vehicles for vehicle pool for use by employees.

Stage 3 Defining business needs and priorities

Transport services within an organization are usually considered a ‘derived demand’, driven by the need to fulfill other objectives rather than being desired in itself. The green fleet strategy delivers cost savings by ensuring that businesses needs for transport are still met, but more efficiently than before. This means that the requirements an organization has of its fleet need to be clearly understood and defined. When defining requirements, Table 4 provides examples of the issues to consider.

Table 2 – Defining business priorities

Issue to consider	Information needed	Things to consider
Travel requirements	- Who needs to travel, for what purposes, when and how often? - What are typical travel distances?	- Can travel be replaced by tele or video conferencing? - Are other modes practicable options for certain journeys? - Could travel be better coordinated? - Are EVs a possibility for some journeys where the range is sufficient?
Operational requirements	- Where are vehicles based? - How are they scheduled? - How far in advance is travel planned? - What availability is needed? - How much spare capacity is needed? - How is refueling managed?	- What types of vehicles are needed most often? - What is the most efficient way to allocate them? - Could charging of EVs or refueling alternative fueled vehicles be fitted into current schedules?
Loading requirements	- What sort of goods or equipment are routinely transported? - What are their typical weights, sizes? - Are there special handling requirements, or loading equipment?	- Are vehicles appropriately specified for typical loads, ie not necessarily all selected on the basis of an occasional maximum load? - Does space required for gas cylinder or battery allow room for intended loads?
Traffic conditions	What sort of locations do vehicles mostly operate in, i.e. in city centers, the suburbs, highways?	Which fuel/vehicle combination is most appropriate for the circumstances, in terms of emissions performance, air quality, fuel economy etc?
Corporate policies and priorities	What else does your organization expect of its fleet, i.e. cost saving targets? Corporate image? Safety improvements?	- What are the implications for vehicle specification? - What performance indicators do you need to focus on?

The environmental drivers for a vehicle fleet will be set by corporate sustainability priorities, operating location and legislation. Examples of drivers and policies that will influence targets and priorities include:

- Climate change
 - Corporate fuel use and carbon reduction targets
 - Environmental management and reporting systems such as the Eco-Management and Audit Scheme (EMAS) and ISO 14001
 - Annual reporting under national indicators on carbon emissions

- Corporate environmental reporting – for example, organizations which have annual sustainability reports that follow Global Reporting Initiative (GRI) guidelines often have to publicly report data based on material aspects of their organization, driving the case for a business need for green fleet management further.
- Air quality
 - Environmental management and reporting systems such as EMAS and ISO 14001

Understanding these will ensure that vehicles are fit for purpose but not over-specified; that unnecessary travel is not undertaken without compromising service delivery; and that new technologies can deliver their intended environmental benefits while still being suitable for your operational requirements, for example, in terms of range and carrying capacity.

Stage 4 Identify opportunities for improvement

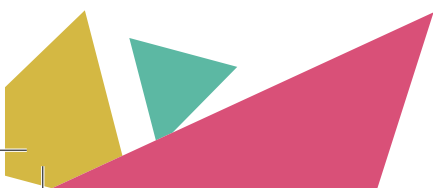
Having collected information on current performance, and ensured that organizational needs are fully understood and defined, the next step is to look for opportunities for improvement.

The first action is often to look into the improvement of systems for monitoring fuel costs and consumption and to manage and plan the need for travel. Very often, once an effective management system is in place, and employees become aware that fuel use is being monitored, improvements will be seen straight away.

Furthermore, the performance indicators provided by good monitoring often point towards further areas where improvements can be made, for example, vehicles that perform poorly against expected kilometers per gallon (kmpg), are underused, or don't meet expectations.

Other areas where improvements can often be achieved include:

- Set targets and providing training for drivers
- Introducing cleaner vehicles and technologies suitable for your operational needs
- Improving vehicle specification processes
- Ensuring that business policies and processes are aligned to support the objectives of efficiency and sustainability, for example, making sure there are no perverse



incentives not to reduce mileage such as mileage thresholds that have to be achieved in car allocation policies

It is not possible to be prescriptive in how this process should be undertaken, as the underlying principle of the strategy is to meet the individual needs of the business. However, efficiencies can usually be identified by taking a holistic review of everything the fleet does, starting with a clear definition of what the business requires it to deliver.

Stage 5 Implementation

Implementation of the strategy involves putting into practice the measures identified in the earlier stages. The rest of this guide provides detailed guidance on individual measures that might be included.

All of the solutions outlined are likely to need tailoring to your organization's business requirements to achieve the best outcomes.

Stage 6 Ongoing monitoring and review

The green fleet management strategy should be a living document, regularly reviewed and updated in the light of changing requirements and new experience. The monitoring processes that are central to green fleet management will help you identify where the opportunities for future savings lie, and will also show which cost-saving measures prove most effective, so you can decide whether to continue or change your approach.

Key elements that should be reviewed are:

- Periodic review and revision of the fleet checklist
- Review business needs and drivers, for example, to take account of any changes in customer requirements, or new legislation or regulation
- Review your monitoring and data collection processes: are they providing the information you need? Are administrative costs acceptable?
- Ensure regular reviews of performance of new vehicles, or new technologies that have been trialed, to ensure they are meeting expectations and are appropriate for your business needs

3. Thinking framework on key steps of green fleet management

3.1. Working with people

Holding people accountable for specified results is a critical point on the path to success. Defining objectives, setting performance targets, and measuring achievements over time are essential steps in converting a green fleet strategy from a raw concept to a detailed plan and ultimately to results. This would not happen without the persistent and visible commitment of the top management.

What does **‘visible commitment’** mean? It means that top management is directly and clearly associated with the green fleet management project by doing all of the following (and possibly more):

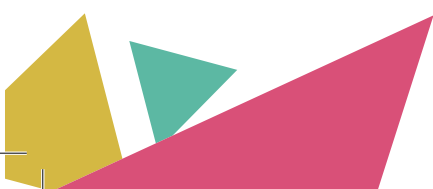
- Not only defining, but also declaring green fleet management project objectives,
- Facilitating and monitoring the progress in achieving the targets,
- Providing feedback on staff’s vehicle performance reports,
- Encouraging staff to make proposals for improvements,
- Providing recognition for achievements,
- Having green fleet performance regularly on the agenda of management review meetings.

All of these points must be done continuously to ensure the endurance of any performance improvement.

3.2. Creating supporting structures and performance measurement framework

Clear accountability and reporting systems must accompany the installation of technology that facilitates the tracking of fuel efficiency (telematics) and the reduction of idling. For example, telematics can provide an extraordinary amount of performance data but without clear accountability, performance targets, and performance reporting, achieving the anticipated return-on-investment available through improved fuel efficiency may prove challenging and difficult.

Public departments have habitually addressed fleet vehicles as a fixed cost rather than an operating practice that must be actively managed. As few people welcome additional performance measures, consultation with supervisors and managers is critical when designing a performance management method in order to guarantee compliance. Performance measurement enables evaluating the progress of a program in achieving its defined goals and objectives. In doing so, it provides managers and



stakeholders with an understanding of how value is created and at what cost. A relatively small number of performance measures can facilitate good outcomes:

- a) clearly linked to the program objectives,
- b) focusing on the key performance issues, and are
- c) timely, reliable, and easily relatable, can facilitate good outcomes.

There are several proven performance measures that can assist with the transition to improved fuel management:

- **Corporate Idling Policy** - Issuing a corporate idling policy, defining that fleet vehicles will not be parked with the engine operating unless essential for the performance of work, helps to raise awareness and support for improved fuel efficiency and is an invaluable first step towards the development of a performance management program.
- **Fuel Efficiency Baselines:** The gathering and reporting of fuel efficiency baselines (and variances) is crucial when measuring improvements and fuel savings, and invaluable for increasing awareness of current practices. Idling, in particular, is so habitual that it is often unseen to both drivers and administrators. The documentation of fuel efficiency (kilometers per liter or gallon) and engine downloads of idling incidence will provide evidence of current driver performance and of fuel-saving opportunities.
- **Approval of Performance Targets** - once baseline data has been gathered and performance variances have been identified, each department can develop targets that reflect their specific operating conditions. Organizations are advised to have a 3-5 year schedule of improvements that reflect increased awareness and commitment to fuel efficiency and reflect emerging opportunities as new technology is installed. Organizations may also benefit from external benchmarks and best practices available.
- **Reporting Program** While the gathering of information and progress reports are essential, clear accountability for fuel efficiency is essential before progress is assured. Ideally, the finance department will have fleet performance targets embedded as part of the organization's sustainability program and goals.

Implementation of a strong change-management program is essential to a successful green fleet program. Reflection of all the above elements will ensure that there is vibrant action towards a defined goal; that role models provide support for the program; that employees, managers, program owner and that the public system is aligned and supportive of improved performance and lasting change. This systems-

approach to change must be supported by a project manager and an appropriate budget for success to be secured.

3.3. Reducing wasted mileage

The use of technology is fundamental to reducing wasted mileage. Accurate route planning using GPS or data networks (i.e. Google Maps) and related smart navigation systems and apps can avoid traffic jams and find the most efficient route, while computerized routing and scheduling software packages will help with the most efficient way of planning vehicle movements.

Increasingly, fleets are turning to onboard telematics systems that offer a number of potential advantages including:

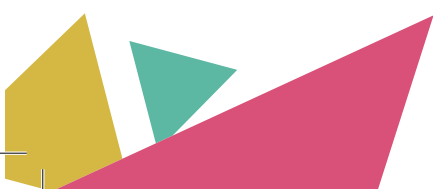
- Enabling real-time routing and scheduling of vehicles
- Eliminating unauthorized private use of vehicles
- Eliminating unnecessary detours on route to the job
- Identifying vehicle inefficiencies due to speeding, harsh driving, and excessive idling

Telematics systems can provide a large pool of information regarding vehicle use and driver behavior. However, it is important that this data is analyzed in order for action to be taken and efficiencies improved. It is also recommended when establishing new supplier or customer relationships that first-hand knowledge is obtained on the location and accessibility, as well as parking/unloading information at premises; often the most direct route is not always the optimal one.

Employee travel by car to meetings and training, for example, can be a major part of an organization's travel activity but the choice of travel for business purposes is often completely unregulated. Organizations should aim to reduce the amount of business car mileage whether in company cars or by the gray fleet. **Gray fleet** is the terminology for all vehicles used by employees that are not owned or leased by the company.

Implementing a sustainable business travel policy is helpful for setting out guidelines for employees on arranging meetings and the travel options available. A useful principle to adopt is that of a 'travel hierarchy', which sets out a decision-making process to minimize travel and its impacts, such as:

- Does there need to be an 'in person' meeting? Will an audio or web conference meet the business need?



- Can a more sustainable mode of travel be used such as walking, cycling or public transport?
- Is there a low emission pool or car club vehicle available?
- Can the journey be shared with a colleague?
- What is the best time for the meeting to minimize journey disruption?

To make sure employees are able to make the most rational transport choice it is necessary to ensure that there are no perverse incentives for drivers to maintain high mileage, for example, minimum business mileage thresholds in car allocation policies.

3.4. Grey fleet management

‘Grey fleet’ is simply the term used to describe any vehicles that do not belong to the company, but which are used for business travel. This might include a vehicle purchased via an employee ownership scheme, a privately rented vehicle or a vehicle privately owned by an employee. When they are driven on company business, often in return for a cash allowance or fuel expense, these vehicles then become considered part of the ‘gray fleet’ – and as such fall under the responsibility of the employer.

Because gray fleet vehicles do not belong to the company, fleet managers face a complicated set of issues when it comes to managing the safety of their fleet. For one thing, employees using their own car may be outside of the established insurance and servicing policies, meaning their vehicles are not covered for company travel.

The gray fleet poses financial, environmental, health, and safety concerns, such as:

- Cost-effectiveness – other forms of car use (e.g. lease, pool or hire) may be cheaper and lump sum and mileage payments can often be much higher than real costs of use, thereby incentivizing unnecessary car travel
- The gray fleet usually has higher emissions compared to lease, hire or pool cars due to age of vehicle, maintenance schedule and lack of control over engine size
- Potential for failure in compliance with relevant HSE regulations.

Organizations with significant amounts of gray fleet travel should audit usage. Software tools are available to manage the record keeping process, and ensure that organizations are complying with legislation by assessing risk and implementing practicable steps as appropriate. For example alternative forms of provision, implementing measures to reduce total mileage and providing advanced driver training/smarter driver training for those identified as higher risk.

3.5. Procurement of a vehicle

When making a decision on procurement of a vehicle, the main consideration is to define the usage purpose, which will depend on many factors, including operational requirements, expected type of trips and environmental and financial considerations. Organizations should approach their fleet management by looking beyond just the capital cost of purchasing a new car or truck.

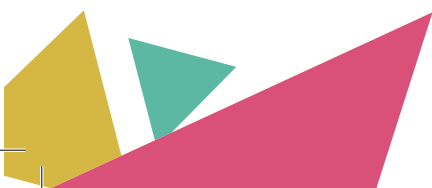
A lease or buy assessment and decision will be needed for purchasing a car or when considering the total annual incurred cost of renting or leasing the whole fleet. For instance, a fundamental question to be asked, is it more cost-effective to lease or buy a vehicle for a certain type of user, type of use and expected length of vehicle service? The decision will depend on a number of factors that should be carefully weighted and aligned with indicators and data from measurements made in the existing fleet as outlined earlier. For example

In managing fleet overhauling, it could sometimes be economical for large organizations to build in-house resources such as maintenance workshop to manage fleet operation & repairs. Taking a wider look at the running cost and the full lifecycle cost of the fleet is considered one of the key approaches in making economic and financial decisions based on lease or buy analysis. Sometimes decisions are made to avoid additional costs that a vehicle might incur due repair, wear & tear, maintenance, spare parts, insurance and other running costs. These elements should be considered as components of the true cost of a vehicle and fleet overall, and cannot be ignored or go unnoticed in the decision-making.

Within organization in UAE, it is commonly seen that there are 3 types of vehicle users:

- Company car users.
- Cash or allowance for car users.
- Private car users.

There are advantages and disadvantages to each type, with underlying financial, operational and environmental considerations, specific to each organization, and should be studied and taken into account when making a decision and be ultimately inserted in the fleet policy.



For many organizations, having basic knowledge or being familiar enough with all these above elements will yield better decisions in the long term and move the company towards a more sustainable, greener fleet.

3.6. Managing mileage and fuel

Whatever the type of vehicles you operate, if they are incorrectly driven, poorly maintained and used unnecessarily, then any benefits of cleaner technology will be negated. Fuel contributes 20-30% to a vehicles lifecycle cost. This is not a fixed overhead that has to be accepted, it is a controllable cost that varies according to vehicle type, driving style, vehicle maintenance and mileage.

Fleets that have implemented fuel efficiency programs often achieve savings in fuel costs of 10% or more, so, for many organizations, the cost of additional staff needed to ensure fleet is properly managed is easily paid back.

This section of the guide goes through the options for reducing the mileage driven by vehicles and improving their fuel efficiency through the steps outlined in Figure 6.

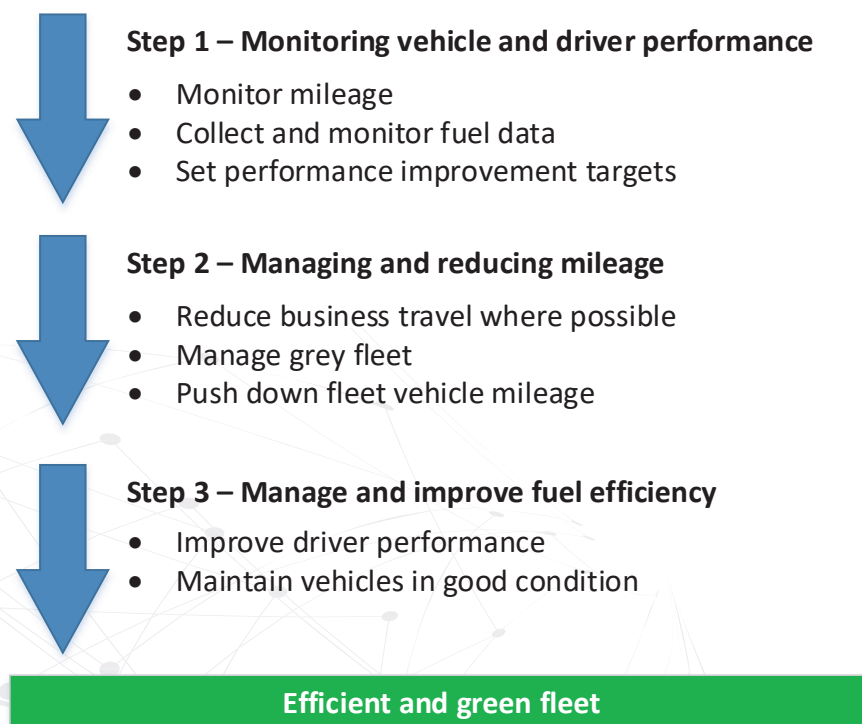


Figure 5 - Monitoring and setting targets

Monitoring vehicle and driver performance

It is only by monitoring fuel consumption and mileage that an organization can understand where and how fuel is being used and what mileage is taking place, and so identify where savings can be made.

The starting point is to understand a fleet's mileage patterns and then compare this with identified business or operational requirements. This will enable identification of underused vehicles or high mileage drivers and point towards more cost-effective and efficient methods of carrying out core business activity.

The following areas should be monitored as a minimum:

- **Business travel mileage** – company cars usage to and from meetings and places of employment
- **Grey fleet mileage** – business trips driven by staff using their own cars
- **Operational fleet mileage** – vehicle use as an aspect of undertaking the core business function

Key to maximizing the performance of vehicles and minimizing their fuel consumption is establishing a system for monitoring the fuel economy – based on kilometers per gallon (kpg) – of individual vehicles and drivers. The two determinants of fuel economy must be captured on a regular basis – **distance covered and volume of fuel used. Armed with just this data it is possible to compare the performance of vehicles and drivers and identify initial opportunities for efficiency improvements.**

There are many ways in which fuel and mileage data can be captured and analyzed. For smaller fleets of up to 25 vehicles, manual systems and the use of simple spreadsheets may suffice. Using fuel cards can also help, as most suppliers will provide fuel economy reports as part of their service. For larger fleets, there are numerous providers of fleet and fuel management software packages, which have monitoring functionality.

Building up a database of vehicle performance figures provides evidence of underperforming vehicles and drivers, allowing corrective action to be taken. For example, drivers/vehicles that consistently underperform their fuel economy benchmark can be identified for training or maintenance. This process also helps to identify possible fuel theft.

Setting performance improvement targets

Establishing clear objectives and targets is essential to help focus on the most important areas for reducing a fleet's emissions and costs. For example, it may be that opportunities for reducing mileage are limited but there is plenty of scope for improving driver performance. In this case, an objective to improve the fleet's fuel economy would be appropriate.

A key challenge in achieving any objective is to gain support and commitment from those who are responsible for transport and travel in the organization, from all managers through to drivers. Setting targets helps focus attention on what is important and quantify the benefit of what is achievable.

Targets can also be used as an effective means of delegating responsibility throughout the company. For example, targets relating to fuel costs, kilometers per gallon and mileage can be set at a companywide level or for departments, teams or even individuals. Table 3 highlights a range of performance indicators for which targets should be considered.

Table 3 – Example key performance indicators

Key performance area	Key performance indicators (KPI)
Fuel	• Fleet-wide average kmpg and fuel cost in fils per mile (fpm) • Department/team-wide average kmpg and fuel fpm • Individual driver kmpg and fuel ppm
Mileage	• Total fleet-wide mileage • Department/team-wide mileage • Individual driver mileage • Total kilometers per employee • Total kilometers per 1000 AED of turnover

Depending on the needs of an individual fleet, a performance monitoring system might use additional indicators such as maintenance, accidents, emission standards, penalty notices, or vehicle use; as well as the indicators based on fuel and mileage. For some ideas on developing KPI, the following categories can be used:

- Cost (operating, per mile or hour)
- Operational (reliability, availability)
- Service (times between failures, number of failures)
- Compliance (alignment with requirements)
- Maintenance (time between preventive maintenance)

- Environmental (emissions measurements)

Depending on the desired scope, list of KPI can span from a dozen to several hundred. Defining standard KPI for fleet management is outside the scope of this book but there are readily available spreadsheets¹ that can help in orientation.

Managing and improving fuel efficiency

There are two key aspects to improving fuel efficiency: driver performance and vehicle maintenance.

Driver performance

Other than the type of vehicle used, the driver is the single biggest factor affecting fuel costs and emissions. Speeding, harsh acceleration, harsh braking, and idling are all driver behaviors that increase fuel consumption and can have an impact on vehicle emissions. Each of these behaviors is also likely to increase the risk of accidents and vehicle wear and tear, including increased tire and brake wear. Anything that modifies poor driver behavior is likely to reap significant benefits in terms of reduced fuel costs, accidents and insurance premiums, and reduced vehicle wear and tear.

All of the following approaches should be considered to try to influence driver behavior:

- Raise awareness
- Assess and train drivers
- Incentivize improved performance

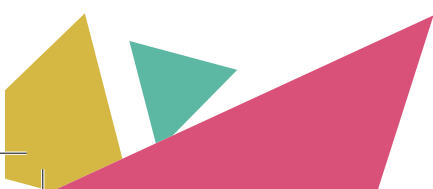
Eco-driving is a method of driving that reduces fuel consumption, Scope 3 GHG emissions and accident rates². Organizations can reduce fuel bills by up to 10%³ and reduce insurance and maintenance costs by encouraging the following:

- Making sure cars are serviced regularly and tires inflated to the correct pressures
- Driving at an appropriate speed to reduce CO2 emissions and fuel consumption
- Avoiding engine idling
- Avoiding carrying unnecessary weight in your vehicle

¹ <http://www.fleetforum.org/wp-content/uploads/2014/01/Fleet-Management-Standards-KPIs.xlsx>

² www.energysavingtrust.org.uk/business/Business/Transport-advice/Smarter-Driving

³ www.greenroad.com/uk/programs/overview/



- Anticipating what is happening on the road ahead to avoid sharp braking or fast acceleration

Drivers should be made aware of their responsibilities with respect to safe and fuel-efficient driving. For example, driving for good fuel economy could feature in driver handbooks, team briefings, and internal newsletters.

The most effective way of raising and maintaining awareness is to circulate fuel economy information to drivers. This can be done privately via line managers or publicly in the form of driver league tables. Whatever method is used the key issue is that drivers are engaged in fuel monitoring. This fact alone is likely to encourage better practices among staff.

In addition to raising awareness, companies are advised to take a proactive approach and assess and train their drivers. With safety in mind, drivers should be risk assessed and those deemed as most at risk considered for training. Driver risk can be assessed using computer-based driver profiling tools and other indicators such as license points, accidents, kmpg and frequency of tire changes.

Another possibility is for employers to encourage their drivers, or stipulate by way of company policy, to undertake smarter/eco-driving courses as an essential selection from the range of accredited courses. Companies can monitor which of their drivers have attended a course on smarter driving to ensure that they are all as fuel efficient as possible and fuel and maintenance costs should fall.

There is clear evidence of the benefits of training. To ensure savings can be sustained day-in, day-out relies on ongoing engagement either through feedback of individual performance, driver league tables or by incentivizing individual or team performance. Incentives can range from the more formal annual bonus award for all drivers and/or teams who meet pre-determined kmpg targets to occasional competitions for outcomes like 'the most improved driver of the month'.

There are many providers of driver training with a focus on safety. Although they may not explicitly cover driving for good fuel economy, many of the principles are the same.

Vehicle maintenance

Vehicles with under-inflated tires, badly out of tune engines or damaged bodywork will use more fuel than those in good condition. Between regular services, deteriorating performance can be identified by monitoring fuel economy allowing any

corrective action to be taken before the next planned service. Poor maintenance can also compromise vehicle safety and increase the risk of accidents.

Possibly the most overlooked issue but one of the easiest to rectify is maintaining correct tire pressures. Maintaining correct pressures are important for several reasons:

- **Fuel economy** – under inflation decreases fuel economy significantly
- **Tire life** – under or over inflation increases wear
- **Safety** – under or over inflation affects grip and braking

3.7. Telematics – insurance and other uses

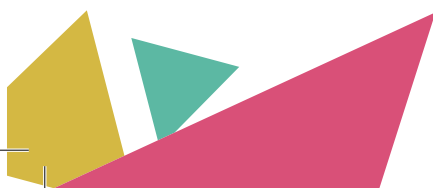
Telematics insurance works by fitting a vehicle with a small device – commonly known as a ‘black box’ – that records speed patterns and distance travelled as well as the type of roads used, along with time of use. The technology can also monitor braking and cornering to build up a picture of user’s driving style.

Used just for the company, paired with good data analytics, companies can analyze differences in consumption and driving style of vehicle users to gain knowledge on possible optimizations.

Used by insurers as company’s partner, data can be used to calculate the cost of your insurance and adjust your premium accordingly, with each aspect having an effect on the price that you pay. A vehicle insurance fee might correspond to total number of miles covered, incurring higher policy prices for driving during peak hours, when there is an increased statistical likelihood of an accident occurring. The insurer can also charge an up-front fee, which includes the cost of the device and its installation, and then quote a price for annual premium which can decrease or increase month on month, depending upon vehicle driving performance.

While the monitoring of driver behavior in this way may sound quite intrusive, it should lead to a fairer pricing system that is based upon the individual rather than a generic set of statistically-based assumptions.

And, above all else, if the use of telematics technology encourages safer and more considerate driving, this should ultimately lead to safer roads. The UK and Italy are leading the way in the provision of telematics insurance, with the Italians having a particularly interesting slant on the use of the technology.



Italian insurers initially used the technology for tracking stolen vehicles but are now increasingly using it to monitor and provide feedback on driver behavior. The scores are even being shared and compared on social networks; healthy competition helps in creating motivation between employees, when set up in a constructive way, by offering rewards for good performance (and staying away from penalties for sub-optimal performance, at least initially).

Although a bit behind the UK and Italy, Germany has seen a significant development in the implementation of telematics insurance with the country's second largest motor insurance provider, The Public Insurers, offering the technology in the form 'Mein CoPilot' (My Co-pilot).

In the US, the technology is slowly growing in popularity, although it's difficult to find a major car insurance company offering it in the same way as UK firms. One US insurer that is offering telematics insurance does so via a system that involves mailing out a black box for the driver to install in their car for a specific period of time before sending it back, via post, so the insurers can assess the data. Another variation on the theme comes via a company based in Texas, which bases its premium prices on distance travelled and requires drivers to send in a digital photo of their car's odometer to show how many miles they have covered.

South African insurers, Discovery, offer incentives including discounted petrol and credit card reward points as part of its telematics insurance package. The package, called 'VitalityDrive', offers a 10% discount on every BP fuel spend and can be increased to 25% if you have your car serviced at a specified garage and even 40% if you buy your fuel using a DiscoveryCard, something that would definitely go down well with motorists in the UK.

Authors have not done extensive review of insurers in UAE for purposes of this book, but if customers start asking thus creating demand, we might start to see innovations in our market too.

3.8. Maintaining the Green Fleet

To ensure that maintenance problems do not occur, organizations should have a strict servicing and maintenance schedule for their vehicles in compliance with manufacturers' guidelines. Drivers should conduct daily or weekly physical vehicle checks to ensure that issues such as low tire pressure or broken lights are identified

early. Again, engagement is required to explain the benefits of why they are being asked to undertake checks. This will promote ownership of the issue and will alleviate complacency.

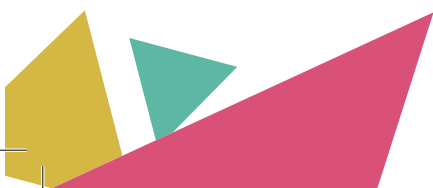
It is recommended that all checks are recorded and audited by an appointed 'fuel champion' to avoid complacency and inadequate checks. It is also important that any noticed faults are quickly rectified and not left until the next routine service.

A major component to maintaining a green fleet is regular preventive maintenance inspections and follow-up repairs. Keeping accurate vehicle/equipment history and maintenance files are an important data gathering exercise for organizing preventive maintenance, as it helps to:

- Track equipment operating and maintenance costs
- Track fuel and oil costs
- Track tire costs
- Track downtime costs
- Track labor (technician) costs
- Track parts costs
- Track body damage repair costs
- Develop accurate life cycling models
- Enable accurate operating and capital budget forecasting
- Cross-reference equipment by unit number, serial number or license number.
- Print ad-hoc reports on a particular piece of equipment, a particular equipment category or the overall fleet

Further, such records will enable the identification of fleet operation abnormalities, as in:

- Excessive fuel consumption (in comparison to identical units performing similar functions)
- Excessive oil consumption (in comparison to Original Equipment Manufacturer (OEM) recommendations and identical engines within the fleet)
- Excessive tire wear that can result in premature tire replacement
- Excessive downtime due to unscheduled repairs.
- Other important benefits to retaining good maintenance history files include:
- The ability to identify repeat repairs and component replacement, which demonstrate that often the result of the problem is being repaired but the root cause of the failure is not being addressed.



- Ensuring maximum warranty cost recovery, since without good maintenance history files, the recovery of the cost of replaced parts that are still under warranty can be missed. Depending on the size of the fleet, this could be a substantial amount of money over the course of a year.
- Regular downloading of the ECM (Engine Control Module), which will enable the Fleet Manager to spot trends, potential problems, and driver habits. Further, in the event of an accident, near miss or traffic violation, the Fleet Manager, and/or Police, can determine actual vehicle speed, engine RPM, hard brake application, stopping time, point of impact, etc. This data can be essential in ensuring the accuracy of the details of the incident.

3.9. End-Of-Life Vehicle Disposal

Older vehicles that remain on the road generate more pollution and spend more fuel than new vehicles – for example, one 10 year old vehicle can generate 30 times more pollution than a vehicle designed today and the same argument is used for fuel consumption. Reasoning this point means that 15 percent of the collective municipal vehicle fleet in the province is responsible for 50 percent of the entire fleet's pollution forming emissions. Besides, older vehicles require more maintenance and care whether it is a cooling system, electrical system, instrumentation, brakes system, oil intake etc.

Fleet aging has another downside, that being decreased driver/passenger and public safety as critical components and systems begin to fail. Conversely, newer vehicles are technologically superior in terms of fuel economy, emissions, safety, power & performance, comfort, drivability, and reliability. There are other, less tangible upsides to a newer fleet, including the opinion that modern vehicles will lift driver morale in an organization and present a better public image to clients and constituents. Regardless of the reason for disposal, it is important to consider what happens to the vehicles that you are disposing of. In a normal large metropolitan city, almost 500,000 to 1 million cars are taken off the road annually, this means dismantling, shredding, exporting etc.

Although many cars could be recyclable, presently it is a competitive disadvantage for many recyclers to take the time to properly dispose of older vehicles. Truly, it is a complex, time-consuming, and costly activity to pull mercury switches and reclaim vehicle batteries versus the simple flattening and shredding inherent in a normal recycling operation.

For case of electrical vehicles, disposal may be an interesting topic from the perspective of battery disposal, as they constitute a significant part of the vehicle itself. Usually all suppliers are aware of the need for battery disposal and offer programs which, in effect, make the owner of the vehicles only a temporary owner of the battery, which is replaced by the manufacturer periodically. Some manufacturers then handle disposal or some even further use for other, less intensive applications (i.e. Tesla PowerWall).

4. Overview of vehicle and fuel technologies

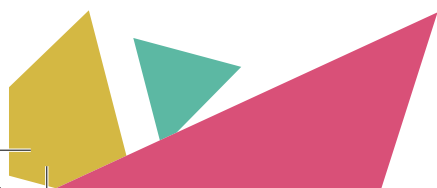
This section sets out the key information needed when considering adopting cleaner fuels and vehicles. The four main vehicle and fuel technologies covered are:

- **Latest technology petrol and diesel vehicles** – these technologies are now meeting ever-tighter Euro emissions standards and reduced CO2 emissions as well as having cars going twice as far on the gallons to petrol.
- **Electric and hybrid vehicles** – these cover pure battery EVs, hybrid vehicles, plug-in hybrids, hybrid assists and range extenders. **The pure battery electric vehicle** is considered as the solution for **zero-emission** vehicles.
- **Gas vehicles** – the main gas vehicles are those powered by liquefied petroleum gas (LPG) and compressed natural gas (CNG). **Compressed natural gas (CNG)** is a fuel that can be used in place of gasoline or diesel to drive vehicles that travel many kilometers each year. CNG costs about 50% less than gasoline and emits up to 90% fewer emissions than gasoline.
- **Biofuels** – fuel delivered from organic feedstock such as bioethanol blends for petrol vehicles, biodiesel blends for diesel vehicles and biomethane for use in natural gas vehicles
- **Future technologies** - fuel cell technology, hydrogen vehicles, self-driving vehicles, drones.

4.1. Latest technology petrol and diesel vehicles

Significant improvements in a vehicle fleet can be made simply by updating the fleet with newer petrol and diesel vehicles. Taking into account the increasing popularity of diesel over petrol, an average new car in 2012 uses around 15% less fuel than a comparable one 10 years ago.

The exhaust emissions associated with poor air quality have also been significantly reduced. These emissions are controlled by legislation known as ‘Euro standards’ and



currently all light-duty vehicles must conform to Euro 6 legislation, which came into force in 2015. Every five years the standards become progressively stricter.

When comparing diesel and petrol vehicles, diesel has better fuel economy and produce less CO₂, however, emissions affecting air quality (NO_x and PM) are higher. Capital costs for diesel are slightly higher than petrol, but the running costs are lower. Traditionally higher mileage vehicles have used diesel because of better fuel economy and lower running costs. Petrol vehicles, on the other hand, are more common for lower mileage use and can be more appropriate in urban areas where air quality is an issue. Modern diesel vehicles are typically fitted with a particulate filter to reduce tailpipe emissions; however, these need to be periodically 'regenerated' to remove the trapped particles. This requires maintaining a high temperature, so diesel vehicles fitted with one can be less suited to short journeys in slow moving traffic.

4.2. Electric and hybrid vehicles

Electric vehicles (EV) use a battery to store electrical energy and are powered using an electric motor. Most can be recharged by plugging into a standard electrical socket, although faster charging will require dedicated fast charging equipment to be installed. The range is still a significant limiting factor; however, with many vehicles now able to exceed 150 kilometers on a charge a high proportion of trips can realistically be undertaken.

Plug-in hybrid electric vehicles (PHEV) combine a petrol or diesel engine with an electric motor and battery. The batteries are continually recharged by the engine or from energy generated during braking. A variant of the hybrid is the 'plug-in' hybrid that is fitted with a larger battery that can also be charged from an external supply. Another variant are 'range extenders': these are essentially EVs but with a small generator to charge the battery if its state of charge drops below a certain level.

Hybrid conversions are also available for some cars. 'Hybrid assist' kits involve fitting an energy storage device (a battery or capacitor) which is linked to the transmission (via a drive belt or direct engine connection).

Environmental performance of EVs and hybrids

EVs have zero tailpipe emissions at the point of use. If electricity is provided from renewable supply sources, near zero fuel lifecycle emissions are possible. Even when 'standard' tariffs are used fuel lifecycle, CO₂ emissions are reduced by up to 40%. Although lifecycle emissions of nitrogen and Sulphur oxides can increase when power-

station emissions are taken into account, these usually occur well away from urban centers.

Hybrids or plug-in hybrids improve fuel economy and reduce CO₂ emissions by around 20-25% depending on the supply source (compared to petrol); their fuel efficiency is therefore similar to diesel. Local pollutants are also significantly reduced compared to petrol and diesel operation. With very high fuel economy (100+ km/g), 'plug-in' hybrids offer even greater emissions benefits (depending on driving mode) and are zero emission in electric-only mode.

Recent research by the Low Carbon Vehicle Partnership⁴ into full vehicle lifecycle assessment of emissions indicated that the level of CO₂ resulting from the production of an EV, hybrid or 'plug-in' hybrid vehicle is higher than for a conventionally-fueled vehicle, but that whole life CO₂ production is 20-23% lower.

Electric vehicles in Dubai

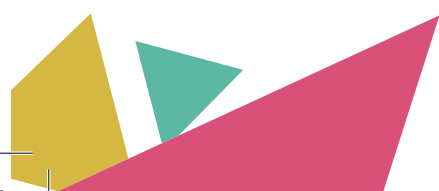
In early 2016, Dubai has adopted a strategy to create a low-carbon economy and promote the use of hybrid cars and electric vehicles. Electric vehicles (EV) operate on electricity as an alternative for fuel and contribute towards the preservation of the environment through emission reduction. At the time of the launch of the Green Mobility Initiative by DSCE in 2015, there were very few electric vehicles in Dubai mainly because there was no EV charging infrastructure available.

DEWA took the lead in setting up the first EV charging infrastructure in the UAE to encourage the public to switch over from petrol to electric vehicles - 100 charging stations were set up across Dubai in 2015. Plan is in place to increase the number of charging stations to 200 in 2018 is part of the strategy. Electric vehicle owners can now sign-up to obtain an EV green charger card to be used at charging points set up across Dubai.

In September 2017, DSCE announced a joint package of incentives for electric vehicles in Dubai:

- DEWA announced the incentive of free charging on DEWA's public electric vehicle infrastructure from 01.09.2017 to 31.12.2019 for registered EV Green Charger users.

⁴ www.lowcvp.org.uk – Reports and Studies



- RTA announced the incentives of free assigned parking, exemption from RTA EV registration and renewal fees, exemption from Salik tag fee and special license plate number sticker for EVs.

Government entities of Dubai are on the way to increase the number of hybrid and electric vehicles in their fleets, in line with DSCE Directive 01/2016 mandating 10% of all vehicle purchases be hybrid or electric by from 2016 to 2020. At the same time, new committees are working on ideas to create incentives and encourage people to buy electric cars instead of traditional petrol-powered vehicles. Electric car owners can expect to be given special privileges in the upcoming period.

This supports the mission and vision of the government to ensure that, between 2016 and 2020, 2% of all cars purchased are either electric or hybrid vehicles. This target is set to increase to 10% by 2030.

Car dealers are being motivated through various measures to increase the visibility of their electric vehicle models to consumers. Coupled with recent announcements from large global car manufacturers on cut-off years for production of petrol-based vehicles and a complete turn towards manufacturing only electric vehicles, it can be concluded that electric vehicles are set to take center stage in the future of transport in Dubai, UAE and globally.

4.3. Gas vehicles

There are two main gas fuels from fossil sources: liquefied petroleum gas (LPG) and compressed natural gas (CNG) which is largely methane. LPG is the most common of the gaseous fuels and is generally used in cars and light commercial vehicles. In the UK, most vehicles are 'bi-fuel', with both gas and petrol fueling systems, allowing vehicles to run on either as necessary.

Natural gas is more typically used in heavy-duty vehicles and buses, although some car and light commercial manufacturers offer this as an option. In light-duty vehicles, the fuel is usually stored as a compressed gas (CNG) and the vehicles are in 'bi-fuel' form so they can run on either CNG or petrol. As the space required for the gas cylinder is greater than an equivalent petrol or diesel tank, this can reduce the carrying capacity of some vehicles.

Heavy-duty vehicles are more often produced as dedicated gas vehicles or in 'dual-fuel' form, which uses both gas and diesel in a diesel engine. Sometimes they can also



store the fuel as liquefied natural gas (LNG) which allows more fuel to be stored and increases range.

An alternative to fossil methane is biomethane produced from the thermal or biological treatment of organic material such as food or agricultural waste. It is a renewable fuel and is used in the same way as NG.

Environmental performance

LPG and CNG have similar CO₂ emissions to diesel vehicles, with CNG perhaps a little lower. The exception to this is biomethane that can reduce CO₂ emissions compared to diesel by some 60-70%. One of the main benefits of these fuels, compared to diesel, is much lower NO_x and PM emissions that can be reduced by 30-50%.

Gas vehicles are much quieter to operate in an urban environment compared to diesel. This can be particularly important for late night or early morning deliveries.

4.4. Biofuels

Biofuels are renewable transport fuels made from organic materials. The main liquid biofuels are biodiesel and bioethanol. There is also a gaseous biofuel, biomethane, which is discussed in the gas vehicles section above.

Biodiesel is derived from natural vegetable oils either as virgin or waste cooking oils. Typically, it is used as a 5% mix with conventional diesel, with no engine modification required. Bioethanol is an alcohol-based fuel made by the fermentation of crops such as sugar beet or wheat. It is typically used in a five to 10% blend with conventional petrol. Higher percentage blends can be used by specially designed flexible fuel vehicles (FFVs) that are able to use any blend of bioethanol.

Environmental performance

Sustainably produced biodiesel reduces CO₂ emissions by around 50% and this rises to around 90% for waste vegetable oil. For bioethanol emissions, reductions can vary from 30% to around 70%. It is important to note that the lifecycle emission impacts of biofuels are highly variable and dependent upon how and where they are produced. Where fuel crops are grown on land cleared from forestry, for example, or where large amounts of artificial fertilizers or agricultural fuel are needed, then the lifecycle carbon impact can be worse than for fossil fuels. There are also concerns about the impact of biofuel production on biodiversity, and on food prices and availability in poor

countries if biofuel production displaces food crops. It is therefore important to be sure about the source of biofuel.

The impact on air quality emissions is also variable. Biodiesel can significantly reduce PM emissions compared to diesel by as much as 60% but tends to slightly increase NOx emissions, which should be taken into account if the vehicles operate in areas where NO2 is the main air quality problem. Bioethanol is very similar to the emissions performance of petrol.

4.5. Comparing the technologies

A cost, emissions and operating range comparison of the main vehicle technology options discussed in this section are shown in Table 4. The costs of the different options are significantly influenced by external factors to the performance of the vehicle itself – for example, grants and subsidies can have impacts, the tax treatment and incentives, consumer perception (i.e. high-income consumers will accept a high price for a well-advertised electric vehicle), and others.

It is important to note that the technologies are changing rapidly, so information on the relative costs, operational and environmental performance, tax treatment and incentives can become quickly out-of-date.

Table 4 – vehicle technology comparisons at a glance

Fuel	Vehicle price	Fuel cost	CO2	NOx	PM	Vehicle range	Vehicle capacity
Diesel	O	O	O	O	O	O	O
Petrol	✓	✗	✗✗	✓✓	✓✓	✗	O
Electric	✗✗✗	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✗✗✗	✗✗
Hybrid	✗	✓	✓✓	✓✓✓	✓✓✓	✓	✗
Plug-in hybrid	✗✗	✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✗✗
Hybrid assist	✗	✓	✓	✓	✓	✓	✗
LPG	✗	✓✓	O	✓✓✓	✓✓✓	✗	✗✗
CNG	✗✗	✓✓	✓	✓✓✓	✓✓✓	✗✗	✗✗
Biomethane	✗✗	✓✓	✓✓✓	✓✓✓	✓✓✓	✗✗	✗✗
Biodiesel (B30)	O	O	✓✓*	✗	✓	O	O
Bioethanol (E85)	✗	✗	✓✓*	✓✓	✓✓✓	✗	O

Key: O – same as diesel, ✗ – worse than diesel, ✓ – better than diesel

* Lifecycle comparison assumes sustainable methods of biofuel production.

Takes account of space required for gas cylinders or batteries. Significant variation between models.

Notes: NOx and PM comparisons are made based on vehicle (tailpipe) emissions.

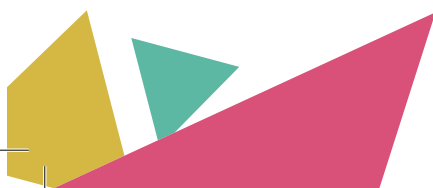
There is currently no clear winner in the battle for the title “most eco-friendly car”. Electric vehicles use the least amount of energy and, along with hydrogen fuel cell vehicles, produce zero emissions from the exhaust. Although diesel vehicles were generally the least efficient, the best ones were able to stand up against their hybrid and electric counterparts, underlining the fact that there is still considerable potential for improvement of conventionally powered vehicles.

4.6. Future technologies and thinking

Other fuels being developed for transport use include hydrogen, which can be used in a converted petrol engine or to power a ‘fuel cell’. This electrochemical device converts the energy stored in chemical form (usually hydrogen) directly into electrical energy, water, and heat. Like battery-EVs, fuel cell vehicles are zero tailpipe emissions at the point of use. Currently, the most economical source of hydrogen is from steam-methane reforming using natural gas. However, for any introduction of hydrogen/fuel cell vehicle, new infrastructure is needed to generate hydrogen, transport and store it. It is for this reason only the few richest economies in the world such as USA and Japan are pursuing limited programs for hydrogen vehicles.

Time is costly, worth money and organizations are anticipated to be wasting thousands of hours of staff time because employees always consider making almost all trips by car or van or bus and this trend will continue to generate challenges in the years ahead. While travel by car and van remains very much part of a business overall daily operations, there are alternative measures that can be applied to reduce fleet running cost and gas emission. And this would include more usage of video conferencing, teleconferencing, other communication means, share driving, carpooling, public transportation, fuel pricing reforms, new legislation or incentives to encourage smaller size engine, new legislation for usage of more efficient engines, walking& bicycling in good climate, green credit collection scheme and viable usage of alternative fuel option such hybrid, gas etc. Moreover, there should be an emphasis on integrating transportation demand side management into future road and rail network project planning and development and into business practice & telecommunication system where heavy traffic can be sensed distantly.

There are virtually endless new possibilities for transport of people and goods being researched, many already in testing phases or nearing market maturity. Technologies such as the Hyperloop, Vertical Takeoff Planes for ridesharing, use of drones for delivery, transport as a service model and many others.



Among the ones that keep raising most attention lately are autonomous cars, also known as driverless cars, self-driving cars or robotic cars. They are vehicles capable of sensing its environment and navigating without human input. Autonomous cars use a variety of techniques to detect their surroundings, such as radar, laser light, GPS, odometry, and computer vision. Advanced control systems interpret sensory information to identify appropriate navigation paths, as well as obstacles and relevant signage. Autonomous cars have control systems that are capable of analyzing sensory data to distinguish between different cars on the road, which is very useful in planning a path to the desired destination.

Many such vehicles are being developed, but as of August 2017, automated cars permitted on public roads are not yet fully autonomous. They all require a human driver at the wheel who is ready at a moment's notice to take control of the vehicle.

Among the potential benefits of autonomous cars are:

- Significant reduction in traffic collisions and resulting injuries and related costs, including a lower need for insurance;
- major increases in traffic flow;
- enhanced mobility for children, the elderly, disabled and poor people;
- relief of travelers from driving and navigation chores;
- lower fuel consumption;
- significantly reduced needs for parking space in cities and the facilitation of different business models for mobility as a service, especially those involved in the sharing economy.

Among the main obstacles to widespread adoption of autonomous vehicles, in addition to the technological challenges, are:

- disputes concerning liability;
- time period needed to turn an existing stock of vehicles from non-autonomous to autonomous;
- resistance by individuals to forfeit control of their cars;
- consumer concern about the safety of driverless cars;
- implementation of legal framework and establishment of government regulations for self-driving cars;
- risk of loss of privacy and security concerns, such as hackers or terrorism;

- concerns about the resulting loss of driving-related jobs in the road transport industry;
- risk of increased suburbanization as driving becomes faster and less tedious without proper public policies in place to avoid more urban sprawl.

If fully autonomous cars become commercially available, they have the potential to be a disruptive innovation with major implications for society. The likelihood of widespread adoption is still unclear, but if they are used on a wide scale, policymakers face a number of unresolved questions about their effects. Other disruptive effects will come from the use of autonomous vehicles to carry goods. Self-driving vans have the potential to make home deliveries significantly cheaper, transforming retail commerce and possibly rendering hypermarkets and supermarkets redundant. Individual vehicles may benefit from information obtained from other vehicles in the vicinity, especially information relating to traffic congestion and safety hazards. Vehicular communication systems use vehicles and roadside units as the communicating nodes in a peer-to-peer network, providing each other with information. As a cooperative approach, vehicular communication systems can allow all cooperating vehicles to be more effective.

Autonomous vehicles are part of future strategies of Dubai, which is why research and development in this area is expected to flourish in the near future in Dubai, transferring best practices and technologies from around the world.

5. Choosing a fleet

Investing in new technologies can be a significant and complex decision. This section will help with the process of deciding what would work best for your organization and business requirements. Information is provided on the support and incentives available to help make the switch to cleaner fuels and technologies.

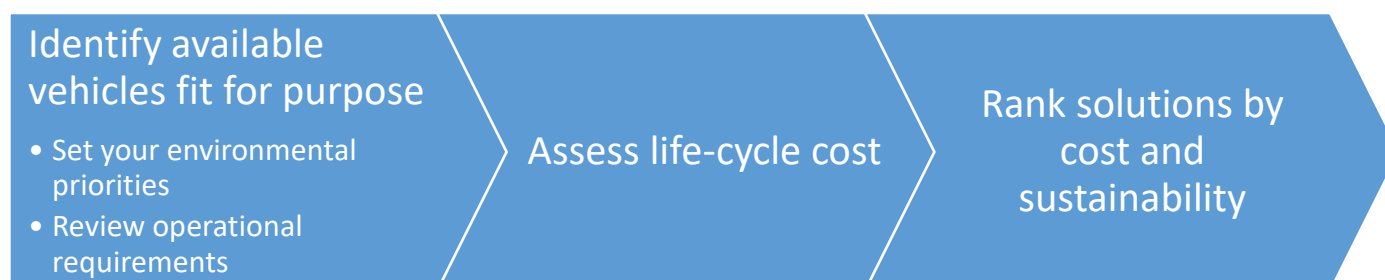
5.1. Assessing the options

In assessing the technology options, three key issues need to be considered:

- Environmental priorities
- Operational requirements
- Lifecycle costs

These help identify which of the available vehicles are fit for purpose. The ‘sifting’ process is shown schematically in Figure 6.

Figure 6 – selecting vehicles to meet business and environmental priorities



Irrespective of which fuel or technology is chosen, the basic principles of a sustainable fleet procurement policy are:

- Specify the smallest, most fuel-efficient vehicle appropriate for the required task, as larger vehicles will tend to cost more and use more fuel
- Aim to get the vehicles with the best fuel economy and lowest CO2 emissions in any given class
- Aim to get vehicles with the best Euro standards available – some manufacturers will bring out vehicles compliant with new Euro standards before the legal obligation date
- Consider new technologies such as start-stop systems that reduce engine idling – this will significantly improve fuel consumption in urban areas

5.2. Defining requirements

The process of defining operational requirements and priorities is an important early stage in the development of a sustainable fleet policy. The aim is to make sure that the uses to which vehicles will be put to are thoroughly understood so that the most suitable can be identified. The table below provides examples of requirements and their implications for vehicle selection.

Table 5 – Defining operational requirements for vehicles

Example	Implications
Large carrying capacity required	Fuel storage or battery space may limit the potential to use gas or EVs
Significant long distance motorway travel	Range and fuel economy likely to mean conventional diesel is the best compromise. Look for the best in class
Significant running in urban centers	Low emissions is a priority, hybrid, EV or gas fuel potentially suitable
High mileage with significant urban operation	Trip lengths and access to charge points may rule out EV but a hybrid or gas should be considered
Urban-based operations with multiple trips per day from a central base	Potentially good opportunity for EV if total daytime mileage is within the battery range

5.3. Assessing the costs

Having identified the vehicles that meet the requirements, it is important that the cost of the vehicles be assessed in relation to how they will be operated.

Use whole life costing⁵ that considers both capital and operating costs (including fuel costs, maintenance costs, road tax, congestion charges, parking fees etc.). This will allow you to capture the benefits of vehicles that may be more expensive to purchase but have significant operating cost savings over their lifetime. Make sure the various financial incentives that are available nationally and locally to support the uptake of these new technologies are accounted for, as discussed below.

5.4. Ranking the solutions

The available technologies should be ranked against environmental criteria and whole life costs. Include in this ranking the existing vehicle choices and see how they compare. It should be possible to improve the environmental performance of a fleet and reduce its costs compared to any existing vehicles. If this is not the case, there should be a clear picture of the environmental benefits that could be achieved and at what additional costs. There may be other benefits that make this additional cost

⁵ See for example www.fleetnews.co.uk/costs/wholelife-costs/

worthwhile such as improving sustainability credentials and using this to win more business.

5.5. Incentives to help make the switch

Many organizations are providing incentives to encourage staff to use low emission vehicles. Some of the incentives schemes include:

- CO2 caps on company car lists
- Alternative fuel vehicle options on company car lists
- Cashback schemes for people opting for smaller, more fuel-efficient vehicles
- Priority parking for low emission vehicles
- Reduced cost parking permits for low emission vehicles
- Car loan schemes linked to vehicle CO2 emissions
- Private car mileage rates linked to CO2 emissions

Before implementing any incentive scheme, it is important to check the current position of relevant financial departments on travel expenses, incentives, vehicle and fuel taxation.

6. Implementation tips & questions to consider

6.1. Fleet management tips

There are many elements that if applied correctly can help organizations either government or commercial in managing their fleet more efficiently and resourcefully. Some relative tips are listed below:

- Select qualified fleet manager.
- Invest in vehicle selection process.
- Hire good drivers.
- Promote vehicles with high fuel efficiency or most economical in fuel consumption.
- Promote cars with low CO2 emissions.
- Adopt fuel-efficient tires labeling.
- Apply kilometers or mileage consumption profile tracking and recording method to detect areas of deficiency and make an improvement.
- Apply real-time driver's monitoring remote system to supervise driver's behavior.
- Ensure vehicles good maintenance plan and programs because vehicles that are not maintained properly consume a higher amount of fuel, burn more emission and have a shorter lifetime.
- Apply driver's evaluation and appraisal scheme on annual basis.
- Apply driver training programs as needed.
- Study alternative fuel usage and apply it if found beneficial.
- Give easy map and journeys routing access to respective staffs in the institute.
- Encourage public transportation usage.
- Where public transport not available, encourage/provide employee carpooling or joint transportation solution
- To manage fleet better, apply vehicle salability evaluation method on annual basis.
- Create vehicle less or car-free day at least once a year to promote sustainability.
- Use recycled water for vehicle washing purpose.
- Encourage electronic and intelligent communication tools such as telephone video conferencing to avoid travel as necessary.
- Insure proper disposal of used parts, batteries etc.
- Apply longer distance kilometers for oil lube change.
- Promote selection of EVs and hybrid vehicles where possible

6.2. Driving Tips

Good driving has always been the fundamental root of fuel consumption reduction and accident's risk decrease. These are considered vital issues to any business oriented and thoughtful organization. Good driving would normally include optimizing between over speeding, over accelerating, over breaking, idling and so on, hence the following tips can be used for organization's drivers to help drive in a more efficient manner aiming at reducing fuel consumption and minimizing accident risk:

- Avoid using a car for short journeys use public transport, cycling or walk when possible
- Plan ahead – pick routes with less traffic
- Apply car share for trips when possible.
- Apply cold starts drive off as soon as possible after starting and do it gently
- Keep tires well inflated, well-inflated tires consume fewer kilometers.
- Drive smoothly and effortlessly, rough
Acceleration and strong braking could have an impact on consumption of fuel.
- Slow down gradually before reaching traffic lights.
- Switch off the engine whenever it is safe
To do so, sometimes during slow traffic jam while a car is in a stationary position.
- Low weight is always recommended – don't carry unnecessary
Loads and remove roof racks when not in use.
- Regular servicing helps keep the engine at its best in terms of efficiency, a good driver should be aware of that.
- Make sure vehicle's tires are inflated to the correct pressure load.
- Do not compromise on safety but be aware that efficient usage of onboard electrical devices increases fuel consumption.
- Check your fuel consumption; it will help you get the best out of a car. Abnormal increase in overall fuel consumption may indicate a malfunction.
- Use cruise control while driving on the street especially when the road is smooth and free.
- During good climate season, use fresh air by opening car windows especially on low-speed drive.
- Do not undervalue the efficiency of trip planning. Getting lost on the road will certainly increase mileage use and therefore fuel costs, as well as increases driver stress levels.
- Avoid driving during peak time or rush hour as necessary.

- Apply proper training and awareness raising programs for drivers.
- Some form of performance awards and recognition schemes for drivers can be added to the whole process, this type of practice will create healthy competition.

6.3. Questions to consider when thinking about green fleets

Reading a guidebook will yield some knowledge on green fleets and how to create them. However, in order to trigger critical thinking and further research applied to our own organizations, it is beneficial to ask some open-ended questions, answers to which will be unique to each organization and each fleet manager. Green fleet management is more than a trend; it is a strategic decision that should not be taken lightly. Asking the right questions ahead of time can save time, pain, and political capital down the road to green. Some examples are:

- Does the green fleet project have the right support within the organization?
- What are the realistic goals for a green fleet?
- What is the real rationale behind going green?
- How to secure buy-in at all levels of the organization?
- How to measure the success of the green fleet project?
- With rising share of electric vehicles, how quickly will the future arrive and how sweeping will the changes be?
- What will the new environment be like and what should an organization do to stay ahead of the pack?
- How will new value be created and captured?
- How much does it cost to drive an electric car?
- When will electrical cars become cheaper than petrol cars? What will trigger the change?
- How much does it cost to buy or lease an electric car?
- Why would consumers choose to drive an electric car? How would that choice benefit the organization?
- How far can an electric car be driven on a single charge?
- How is the maintenance for an electric car different from a gasoline car?
- What are other alternative fuels that can be used in a fleet?
- How do you find charging stations on the go?
- What will driving be like in the future, is Autonomous driving is going to be the trend.
- How does the car see the road?
- Will gas/ petrol stations be obsolete in the near future?

7. Summary and conclusion

If a fleet is not managed properly, it will surely consume more fuel, generate unwanted gas emissions and increase capital& operating costs that might effects profitability a good deal. With respect to improving today's economic circumstances and mitigating environmental concern, a current fleet technology is emerging at present and providing plenty of options for a fleet manager to implement green strategies and solutions.

What are the key components to manage fleet more efficiently, what are the key performance measures? One key element is to build awareness scheme across the whole organization, another is to reduce GHG emissions and to enhance the fleet financial performance of the institute. Moreover, the green fleet action plan ought to be disclosed to all key stakeholders in the organization so a maximum commitment from all will be built and created. Initiatives can be summarized and concluded to some overreaching goals as follows:

- Fuel consumption reduction target without the growth increase.
- Total mileage reduction target.
- Establishment growth % outlook target.
- Introduction of alternative fuel target.
- Operating & maintenance expenditure reduction target.
- CO2 reduction and greenhouse gas (GHG) reduction target.
- Lube oil consumable reduction target.
- Number of accidents reduction target.
- Mass transportation usage target.
- Fleet maintenance Cost reduction target.
- Other measurable, measured and achievable green sustainable fleet goals.

Appendix: Understanding the global context for green fleets

Climate change and transport

The issue of transportation and its negative impact on climate change is contradictory in nature since transportation conveys substantial socioeconomic benefits, but at the same time, transportation is affecting environmental systems. From one side, transportation activities support increasing mobility demands for passengers and freight, while on the other, transport activities are associated with growing levels of environmental externalities. The growth of personal and freight mobility in recent decades have expanded the role of transportation as a source of emission of pollutants and their multiple impacts on the environment. These impacts fall into three categories:

- **Direct impacts.** The immediate consequence of transport activities on the environment where the cause and effect relationship is generally clear and well understood. For instance, noise and carbon monoxide emissions are known to have direct harmful effects on the environment and air quality.
- **Indirect impacts.** The secondary (or tertiary) effects of transport activities on environmental systems and human health. They are often of higher consequence than direct impacts, but the involved relationships are often misunderstood and more difficult to establish. For instance, particulates are mostly the outcome of incomplete combustion in an internal combustion engine are indirectly linked with respiratory and cardiovascular problems since they contribute among other factors to such conditions.
- **Cumulative impacts.** The additive, multiplicative or synergetic consequences of transport activities. They take into account of the varied effects of direct and indirect impacts on an ecosystem, which are often unpredicted. Climate change, with complex causes and consequences, is the cumulative impact of several natural and anthropogenic factors, in which transportation plays a role. 15% of global CO₂ emissions are attributed to the transport sector.

The relationships between transport and the environment are multidimensional. Some aspects are unknown and some new findings may lead to drastic changes in environmental policies, as it did in regards of acid rain and chlorofluorocarbons in the 1970s and 1980s. The 1990s were characterized by a realization of global environmental issues, epitomized by the growing concerns about anthropogenic effects and climate change. Transportation also became an important dimension of the concept of sustainability, which has become a core focus of transport activities, ranging from vehicle emissions to green supply chain management practices.

The environmental impact of transport is significant because it is a major user of energy, and burns most of the world's petroleum. This creates air pollution, including carbon dioxide, nitrous oxides, and particulates, and is a significant contributor to global warming through emission of carbon dioxide.

Transport-related problems experienced today and in the perspective of “business as usual” on a future horizon are likely to worsen according to the projected increase in traffic. The motor vehicle engine emits many types of pollutants including nitrogen oxides, carbon monoxide, particulates, Sulphur dioxide, lead (in some cases) and the greenhouse gas carbon dioxide. Impacts of transport on the environment include acid rain, human health effects, global warming and noise pollution. Environmental impacts of transport systems include traffic congestion and automobile-oriented urban sprawl, which can consume natural habitat and agricultural lands.

Gradual climate change such as increases in temperature, sea level and rainfall regimes and the projected increase in frequency and intensity of some extreme weather events will seriously challenge the transport sector. Moreover, the most significant impact of climate change is that its destructive changes in the environment, caused by human activity, are very gradual and take a long time to become fully visible.

Rising temperatures and extended heatwave periods increase the problems of rail buckling for metro trains, road surface deterioration and thermal discomfort for passengers in vehicles. Weather extremes can lead to short-term delays and interruptions but also long-term interruptions and detouring needs in the event of destroyed infrastructure. Sea-level rise can threaten harbors and other transport infrastructure and services in coastal areas. Air transport can be challenged by changing wind patterns, flooding of airport infrastructure, and other weather events. In addition, climate impacts that trigger changes in the organization of society and economy, like different tourist destinations or agricultural production, can have an impact on transport demand. All of the above is very much relevant for UAE.

People across the globe who drive vehicles every day can help reduce their fuel use and slow down the rate of climate change by making a commitment to drive more fuel-efficiently. For example, planning trips carefully to drive at the posted speed limit, maintaining proper tire pressure, or even walking or taking a bus, multiplied by a

number of people undertaking a change of behavior can result in major fuel and environmental impact reductions.

Apart from using alternate modes of transportation, if a trip must be made, one of the easiest actions that regions and nations can take – with a simple step – is to avoid unnecessary idling – keeping vehicle engines running while the vehicle is not used for transport. Idling is not only a waste of energy and money – it is a waste of fuel, which does not serve the purpose of a vehicle which is to move – and is a source of greenhouse gas emissions. While reducing vehicle idling alone will not solve the climate change problem, it is a step in the right direction and it is easy to do. Technologies such as “Start-Stop” exist today, shutting down car engines at stoplights to save gas (in case of UAE, when weather permits), making idling reduction almost automatic. When money-saving technologies effectively pay for themselves, they gain scale very quickly—thus lowering the manufacturing costs and further boosting the return on investment. The logic of start-stop will become only more compelling as it becomes more popular.

Keep in mind that if we each do our part, our individual actions add up.

Transportation emissions and environmental health

Human exposure to smog—a mixture of ozone and particulate matter from vehicle exhaust and smokestacks—is of particular concern. Table 1 lists the major sources of vehicle emissions and their effects on both human health and the environment.

By adopting efficient practices in managing vehicle fleets, organizations can reduce harmful transportation emissions, noise, and spillage of pollutants to water and soil associated with the transportation sector. A fuel- and cost-efficient fleet will also save money in operating, maintenance and capital costs.

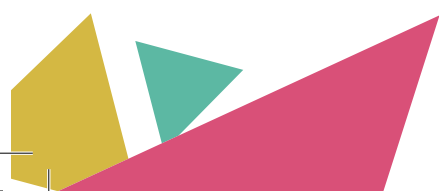


Table 6 - Impact of vehicle air emissions⁶

Type of emission	Is it a GHG?	Harmful effects and type of impact	Scale
Carbon dioxide(CO₂)	√	Human health Human health (circulatory, reproductive and nervous systems) Climate change	Global
CFCs (vehicle air conditioners)	√	Climate change	Global
Particulate matter (PM_{2.5}, PM₁₀)		Human health	Local and regional
Hydrocarbons			Regional
Lead (in older fuel additives and batteries)		Human health	Local
Methane (fuel production)	√		Global
Nitrogen oxides (NO_x)	√	Human health, ecological damages	Local and regional
Tropospheric ozone (smog-forming combination of nitrogen oxides and volatile organic compounds (VOCs))	√	Human and plant health	Regional
Sulfur oxides (diesel engines)(SO_x)		Human health	Local and regional
Volatile organic compounds (from fuel production)		Human health	Local and regional
Carbon monoxide(CO)	√	Human health, climate change	Very local

For better understanding, the below table gives an operational comparison for each type of fuel. In general, different fuels have different environmental benefits, likewise with respect to Diesel, CNG, hybrid, biodiesel, LPG, Gasoline/Hybrid and electrical have lower emissions.

⁶ Transportation Sector Research Final Report, prepared by Marbek Resource Consultants Ltd. for FCM. http://www.sustainablecommunities.fcm.ca/files/Capacity_Building_Transportation/Transportation_Sector_EN.pdf.

Table 7 - Operational comparison for types of vehicle fuels

Fuel type	Fuel efficiency	Fuel cost	Vehicle cost	Maintenance cost	CO2
Gasoline	2	2	3	3	1
Diesel	3	2	2	3	1
LPG	1	3	2	2	2
Gasoline/Hybrid	3	2	2	2	2
CNG	2	2	2	1	2
Electric	3	3	1	2	3

Legend: Excellent= 3, Good= 2, Satisfactory=1

Emissions from vehicle fleets are one of the main source of our air pollution including, apart from the widely known CO₂, NO_x, SO_x, HC and other harmful particles. The amount of fuel a vehicle uses will always relate to the type of fuel, type, and size of the engine, vehicle maintenance, route selection and the way the vehicle is being run and driven. On top of that, the emissions of a vehicle will always be proportional to the fuel quantity consumed. There are significant variations in fuel consumption (km/l) between different types of vehicles. Some vehicles, due to advanced engine specifications can reach the same distances with less CO₂ burnt and less fuel consumed which means cars will go further on one gallon of fuel. Some measures to consider when it comes to vehicles are therefore:

- Type of fuel
- Operational requirements of vehicle
- Class, size, cost
- Kilometers/gallons (kilometers/liter) performance
- Safety
- Gas emissions
- Maintenance

However, to ensure an optimal approach is reached, a systematic approach is needed, including many other parameters. We will look into all of the above points in more detail in upcoming chapters.

United Arab Emirates and Dubai

Road transportation accounts for more than 30% of all CO₂ gas emission worldwide and approximately 25% within the UAE. Transport sector share of greenhouse gas emissions in UAE was 22% in 2013, making it the second largest contributor, with

electricity and water generation being the first⁷. On a national level, diesel and gasoline are by far the most used fuels, and only initial efforts have been taken to introduce CNG, biodiesel, hybrid, electrical and other types of vehicles that can shape up the future green fleet.

The Green Economy concept for sustainable development and poverty eradication calls for collaborative efforts from all countries and stakeholders to implement bold and transformative steps needed to shift the world onto a sustainable and resilient path. UAE has agreed on Green Economy at the United Nations Rio+20 Summit and has reflected these objectives in UAE Vision 2021. This “sets the key themes for the Socio-economic development of the UAE” and calls for “a shift to a diversified and knowledge-based economy”. It focuses on demonstrating commitment towards Green Economy and to achieve green objectives, economic growth and become one of the best sustainable countries globally.

On the example of Dubai, Roads and Transport Authority (RTA) has embraced the UAE Green Growth Strategy and aligned it with the broader policy framework as indicated in Figure 1. RTA has set up a strategic Energy and Green Economy Working group, involved in implementation and monitoring of the E&GE plan across the organization.

Some of the other recent steps taken by the UAE Government in building a sustainable transportation include launching:

- **Dubai Green Mobility initiative** - Dubai Supreme Council of Energy (DSCE) launched the Dubai Green Mobility initiative to encourage the use of sustainable transport and electric vehicles to contribute to achieving sustainable economic development.
- **Dubai EV charging stations** – Dubai Electricity and Water Authority (DEWA) installed the first 100 public EV chargers across Dubai. Work is ongoing at present to further expand the network. Similar initiatives are starting to be planned in other Emirates.
- **Hybrid Taxi project** – after a three-year pilot phase, results indicated an improvement of fuel efficiency by 33% and reduced carbon emissions by more than 27 percent. The usage of Hybrid Taxis has been expanded to more than

⁷ UAE Ministry of Energy: UAE GHG Inventory 2013 Report

70 in the year 2015 which is planned to grow further to achieve the 2021 target to convert 50% of the fleet to hybrid.

- **Dubai's address system** - In 2016, Dubai was divided into 14 districts and each district was given a name for identification. This naming complements Dubai municipality created smart geo-addressing system 'Makani', enabling precise identification of entrances to the buildings.
- **'Sirb' initiative for using drones** – DEWA launched the 'Sirb' (Arabic for Fleet) initiative to promote the use of modern technologies in serving people. The initiative aims to use drones to enhance Dubai's infrastructure by serving as a means of providing service in line with the highest international standards and build a happier society.
- **Dubai Autonomous Transportation Strategy**
- **Abu Dhabi Transportation Mobility Management Strategy**
- **Surface Transport Master Plan (Abu Dhabi)**
- **Public transport systems (bus, taxi, metro in Dubai...)**



Figure 7 - Sustainable transport policy framework for Dubai

Rationale for focusing on fleets

Whether large or small, urban or rural, private or public, organizations own and operate fleet vehicles to deliver a variety of municipal services. However, depending on the size of the organization and what fleet services it provides, its fleet will be the main contributor overall transport emissions at any level of observation (city/region/national).

With the total cost of fuel and associated costs of operation increasing, having in mind all considerations presented in earlier chapters, many fleet operators have started to “green” their fleets by exploring the use of alternative fuels, improving operational fleet standards, enhancing fleet manager knowledge, purchasing new vehicle types and technologies and other measures.

Organizations that have already shifted toward greener fleet vehicles have discovered multiple benefits:

- **Lowered costs, greater returns** — by limiting inefficient business practices such as excessive idling or out-of-the-way travel routes, fleet managers can reduce fuel consumption and increase productivity.
- **Capital and operating cost reductions** from choosing properly-sized vehicles and eliminating older, inefficient vehicles
- **Increased overall business efficiency** — the positive results from having a well-run fleet can overflow into other areas of the company as well. Customers receiving their goods and services in a timely manner are likely to become repeat customers. Regular vehicle maintenance can lead to reduced instances of costly vehicle breakdowns that cut into the company’s overall annual budget.
- **Improved local air quality** – greener fleets produce fewer pollutants thereby increasing air quality. In some cases where local refueling stations were installed, they can subsequently be removed along with any odors such a facility can emit.
- **Support for local economies** by buying fleet-related products and services that are made locally.
- **Improved employee happiness** — an impartial structure and established company policies applied fairly and accurately across all levels of employment leads to increased employee satisfaction with the company and with their own jobs.
- **Opportunities to show leadership** on environmental issues and meet municipal environmental goals.

- **Strengthened corporate peace-of-mind**—a good fleet management program reassures c-suite individuals and decision-making boards that the company is maximizing its successes and minimizing its risks.
- **Commitment to corporate social responsibility** - looking after the interests of customers, employees, shareholders, stakeholders, communities, and the environment, considering consequences of business activities.

In summary - if your business needs multiple vehicles to function properly, you need some form of fleet management to ensure that your efficient fleet operation, safety and achieving its greatest potential in support of the organization.

Next chapter will look into the process of developing a sustainable management fleet, demonstrating along the way the variety of measures that can be applied to a fleet in order to achieve these benefits. A green fleet plan that includes a strategy to reduce the emissions of heavy-duty vehicles will enable you as a Fleet Manager to implement a variety of measures with an understanding of how they fit together and how they should be prioritized.

