Social responsibility and sustainability in motorway corporate governance

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Abstract: This paper analyses how a motorway concessionaire faces the challenge posed by the raise of road traffic volumes in the North-East of Italy. The concessionaire has planned to invest in the near future a large amount of money in the network upgrade. The construction phases will predictably induce the risk of traffic congestions. Then an intelligent traffic management system becomes necessary to support the management in making decisions on the traffic control, especially during emergencies and unusual conditions. In this perspective, the concessionaire is going to adopt a governance system and the related codes of conduct to operate also according to fundamental sustainability values. To this purpose, the balanced scorecard model is adopted. In particular this paper describes how the balanced scorecard model, originally developed for use in the private sector, has been adapted for use in a modern motorway concessionaire firm to estimate its corporate efficiency and to evaluate environmental and social performance.

Keywords: social development; corporate governance; sustainability; motorway; price cap; sustainable organisation; balanced scorecard.

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1 Introduction

The strong economic growth experienced in the last century has been accompanied by gains in material welfare in all parts of the world (Tribe, 2006). The real Gross Domestic Product (GDP), according to estimates released by the Bureau of Economic Analysis, is expected to expand by 75% between 1995 and 2020, bringing with it increased pressures on environmental and social resources. The combined effect of economic globalisation, development of transport systems and new communication techniques has a profound influence on the world development (Nederveen et al., 2003). Many analyses of these phenomena are based on a deterministic view of economic and social transformations (Mayer, 2003), which contribute to the explanation of crisis affecting old industrial cities, of relocation of businesses (Geddes, 2005), of extension of suburbs, of growing competition between cities, of constitution of large housing areas forming archipelagos separated by empty areas and formation of city networks (Bonetti, 2005).

In particular, the progress of communication techniques, especially the internet, has produced an increase of working from home, a development of electronic commerce and a relocation of companies Uri (2001). Finally, the expansion of transport systems favours the increase of geographic mobility, coupled with the rise in land prices and the increase of air and noise pollution. As a consequence governments, pursuing sustainable development, face the challenge of discerning how best to balance the challenges and opportunities of growth and to decouple economic growth from environmental and social pressures (Papadopoulos, 2000). In this scenario, the existence of a complete highways network, adequately managed and maintained and with sufficient capacity is essential for the good progress of the national economy. Concession systems are in a widespread use in the road sector in Europe: concessions differ from public contracts in the transfer of the responsibilities of operation that they entail (Aschauer, 2000). The mission of most of the concessions holders is just to plan, build, expand and manage a motorway network. In the recent years, a new factor has acquired more and more importance: sustainability. Sustainability is a systemic concept that, according to World Commission on Environment and Development, relates to the continuity of economic, social, institutional and environmental aspects of human society. It is intended to be a mean of configuring civilisation and human activity so that society, its members and its economies, are able to meet their needs and to express their greatest potential in the present but, at the same time, to preserve biodiversity and natural ecosystems.

Effective sustainability affects each level of the society, from the local neighbourhood to the entire planet Greenstein et al. (1995). Firms should not consider it as an additional requirement, but as an overarching principle, which governs all the development processes. As a consequence, sustainable development requires economic, environmental and social policies to be designed and implemented in a mutually reinforcing way.

Furthermore, it requires new management approaches to improve policy coherence, to increase the role of knowledge in the formulation and implementation of policies, and to devise a better communication between civil society and business (Apeland and Scarf, 2003). The sustainable development perspective stresses the long-term compatibility between the economic and the environmental and the social dimensions of development. Within the above framework, in this paper we address a business approach, named corporate sustainability, that creates long-term shareholder value by exploiting opportunities and managing risks deriving from economic, environmental and social

developments. Successful corporate sustainability leaders achieve long-term shareholder value by gearing their strategies and management to harness the market's potential for sustainability products and services while reducing, if not avoiding, sustainability costs and risks.

This paper is based on an idea of the Operations Director of S.p.A. Autovie Venete (AV), (the first author) to use the balanced scorecard model (Kaplan and Norton, 1993) for the specific sector of motorway concessionaires in order to estimate its corporate efficiency and to evaluate environmental and social performance. After a brief discussion of different approaches for quantifying sustainability and of the issues about environmentally sustainable transport, we illustrate some important aspects such as productivity effects of road investment, regulation and licensee motorways companies in Europe and in the Italian highways network, especially in the North-East.

In addition, this paper takes a closer look at the process of formulating a sustainability balanced scorecard for a motorways concessionaire. Before doing so, the basic conventional approach of the balanced scorecard is outlined.

2 Quantifying sustainability

In this section, we propose a brief discussion of different approaches for quantifying sustainability. The corporate sustainability performance can be financially quantified so that the investors have an investable corporate sustainability concept (Goodland, 1995). A growing number of investors are convinced that sustainability is a catalyst for enlightened and disciplined management. Virtually, the development of sustainability is driven by the two following crucial success factors.

- The concept of corporate sustainability is attractive to investors because it aims to increase long-term shareholder value: since corporate sustainability performance can be financially quantified, the investors have an investable corporate sustainability concept.
- The sustainability leaders are increasingly expected to show superior performance and favourable risk/return profiles.

As this benefit circle strengthens, it will have a positive effect on the societies and economies of both the developed and developing world. Increasingly, investors are diversifying their portfolios by investing in companies that set industry-wide best practices with regard to sustainability (Lado, 1992). What private and institutional investors need is a global, rational, consistent, flexible and, most important, investable index (like the Dow Jones Sustainability Index World) to benchmark the performance of their sustainability investments. Investors also need an independent reliable index as a basis for derivatives and funds focused on sustainability companies (Atkinson, 2000). With adequate market signals and incentives to modify behaviour in line with sustainability, policy makers can secure more efficient resource use, which in turn implies higher overall welfare and equity today and in the future. In particular, it is important to define sustainability indicators for anticipating the fickleness of human–environmental interaction.

The development of environmental indicators is dominated by the so-called Pressure–State–Response (PSR) model of Organisation for Economic Cooperation and Development (OECD). The PSR contains a set of indicators measuring anthropogenic

pressure (P) on the environment, the state (S) of the environment resulting from such pressure and the societal response (R) to ease the pressure (Linster and Jill, 2001). The strength of the PSR is its ability to take into account the causal relationship between the state of the environment and human activity. Its major weakness, however, is the lack of sophistication of the mathematical and cognitive models representing the causal relationship.

As a result, current indicator systems based on the PSR fail to consider contingencies in human–environmental interaction that make the future state of the system difficult to ascertain. Recognising the fickleness of human beings and nature will result in indicators very different from the traditionally developed ones. They can be identified in the following important areas of indicator development:

1 indicators for the sustainability ecosystem impacts of production, which measure changes in production outputs and environmentally significant inputs (Hukkinen, 2003)

2 indicators of bounded carrying capacity, which use alternative scenarios of human–environmental interaction to specify the ecosystem-specific limits that societies might impose on industrial production (Van Den Bergh, 1993)

3 indicators of congruence between ecosystems, institutions and production, which measure the compliance between the functions of an ecosystem and the institutional rules governing its management (Hukkinen, 2003)

4 indicators of technological and institutional path dependence, which observe and potentially strengthen lock-ins in human–environmental interaction (Hukkinen, 2003).

These development challenges imply that sustainability indicators should be considered more as tools for improving communication between different communities of experts on the sustainability of a particular system of human–environmental interaction, rather than as universal measures of sustainability (Barber and Strack, 2005).

3 Environmentally sustainable transport

In this section we consider sustainability, with its indicators, in the transport sector. In order to integrate and communicate the knowledge in the assessment of the environmentally sustainable aspects of transport technologies and policies, it is necessary to adopt a systemic approach to environmental and transportation issues pursuing four main objectives:

- designing harmonised methods to build environmental indices to be applied to the transport sector in the different countries
- assessing the level of environmental sustainability of transport systems and exploring new transport scenarios
- assembling scientific knowledge between disciplines and countries through common research projects, forum of discussion, congresses and exchange of scientists
- disseminating the knowledge and the sustainability assessment tools among decision makers, consultants and the public, especially by high-level teaching.

But it is necessary, too, to assess the level of sustainability of the transport system in the past, present and future times with a long-term approach, to develop long-term scenarios based on possibilities and constraints and to identify tools and strategies capable of achieving scenarios themselves, in terms of transport technologies and policies (Geerlings and Stead, 2002). Significant improvement can be achieved in the short to medium term in the environmental performance of current transport arrangements.

4 Aggregate productivity effects of road investment

In this section, we suggest some answers to these policy questions: Has the development of the transport sector been a driver of globalisation? Does transport policy underrate its role to support international trade and foreign direct investment? Does transport policy action have substantial income effects by facilitating trade? Do transport infrastructure investments reduce international trade costs? Which domestic policies have strong trade cost reducing effects? Knowledge about the productivity effects of infrastructures would allow more informed decisions to be taken on the overall budget allocation for infrastructure investment in general and transport infrastructure in particular. The strong role assigned to transport infrastructure investment as a vehicle for economic growth appears to be worth critical examination for at least two reasons.

1 There is no strong growth theory foundation for the hypothesis that an increase in transport infrastructure investment would lead to an immediate and lasting increase in growth rates of economic activity; rather, according to the exogenous growth theory, an increase in the investment rate (which does not necessarily result from an increase in transport infrastructure investment) leads to an increase in the income level.

2 There is no clear, empirical evidence that transport infrastructure investment leads to higher growth or even to a higher level of income.

Aschauer (1989) started the discussion on the productivity effects of public investment followed by Gramlich (1994); moreover, Kopp (2005) found out large positive productivity effects being caused by public investment. Kopp reviewed the previous attempts to measure the macroeconomic effects of infrastructure investment which often suffer from an unresolved endogeneity problem.

Considering the i of n countries, the relation between economic growth and road infrastructure development is shown in (1). This relation, named national production function, shows that, omitting time subscripts, the countries which have relatively transport-intensive industries benefit more than countries with relatively low transport intensity from an increase in road infrastructure investment:

$$Q_i = U_i F^i \left(K_i, H_i, L_i T_i \left[G_i, V_i \right] \right) \tag{1}$$

Where n is a set of countries and the production of gross output Q_i, for each country i, depends on non-transport capital stock K_i, employment L_i and transport services T_i.

Output also depends on the economy's technological level U_i, which is assumed to progress in a Hicks-neutral way. Transport services depend on the services of road stock G_i as well as the national stock of transport equipment V_i. Equation (1) represents the gross production function of the representative firm using the primary inputs,

capital K, labour L and transport services T, as the only intermediate input. The transport services are produced using road services G and the services of the vehicle stock V. The firms do not choose input G but the number of vehicles, which is V. From gross output function (1), taking logarithm and total differential, yields Equation (2)

$$\frac{dQ}{Q} = \frac{dU}{U} + \frac{F_k K}{F}\frac{dK}{K} + \frac{F_L L}{F}\frac{dL}{L} + \frac{F_V V}{F}\frac{dV}{V} + \frac{F_G G}{F}\frac{dG}{G} \tag{2}$$

where F_j denotes the derivative of the production function with respect to input *j*, and the coefficients $F_j J/F$ indicate production elasticities, that is, the percentage increase of gross output if the input *j* is increased by 1%. Consequently, output elasticity with respect to road services is not directly observable and firms do not take input decisions with respect to road services. However, input decisions with respect to vehicles are not independent of the road services provided by the existing road capital stock.

The output elasticity with respect to road services can be expressed relative to the elasticity with respect to vehicles:

$$\frac{F_G G}{F} = \left(\frac{F_G G}{F} \Big/ \frac{F_V V}{F}\right) \bullet \left(\frac{F_V V}{F}\right) = \phi \bullet \left(\frac{F_V V}{F}\right) \tag{3}$$

where the parameter equals the ratio of output elasticities of roads and vehicles and it is expected to be positive because economies which are relatively transport-intensive probably are also relatively road-intensive. The production elasticity of vehicles measures the transport elasticity of the national economy. Hence the parameter links the observed transport intensity of the economy to the indirect input road use.

It is important to point out that the production theory framework explicitly includes the modelling of national transport intensities and the fact that transport services depend on private capital investment and government investment in roads. The endogeneity bias is addressed by introducing an estimation breakdown which combines national productivity effects with overall productivity effects for the country group as a whole, to make residuals of the estimation orthogonal to the explanatory variables.

Productivity is measured by the Toernquist productivity index. The productivity effects depend on the sign of the ratio of vehicle stock to the road stock elasticity of production. Kopp calculated the expression for the national growth rate of productivity and developed an empirical analysis including western European countries for which data were available. The largest gaps in the data were found for transport infrastructure investment and for the real value of vehicle stock. The countries in the sample were Austria, Belgium, Finland, France, Germany, Italy, The Netherlands, Norway, Portugal, Spain, Sweden and UK. Kopp shows that investment in road infrastructure indeed has positive macroeconomic productivity effects, also if the results of this paper (Kopp, 2006) do not justify as general conclusion that national road infrastructure investment levels should be increased. In conclusion, the fixed-effects panel data analysis shows that transport infrastructure has a positive effect on macroeconomic productivity. The variance of road infrastructure investment in the panel explains, however, only a small part of the macroeconomic productivity development.

5 Regulation and licensee motorways companies in Europe and in Italy

In this section we propose an overview of the application of motorway concession contracts in Europe and specifically in Italy, of the difficulties currently encountered by the European and Italian road administrations in the utilisation of the concession option and of the Public-Private Partnership (PPP) in the motorway field with its key-factors of success. The first directive on the public works contracts of 1971 gives the definition of the concessions of public works. Currently the Green Paper (2004) on the PPP refers to contractual agreements formed between a public agency and private sector entity that allow for greater private sector participation in the delivery of transportation projects proposing broad lines of 'forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction, renovation, management or maintenance of an infrastructure or the provision of a service'. The Green Paper also explains how to face the challenge for the Internal Market to facilitate the development of PPPs under conditions of effective competition and legal clarity.

The diversity of the concession systems introduced by the various European road administrations deals with the respective roles of the concession company and the public authorities. In particular, in the risk sharing between concession authority and concession company, various situations exist: risks borne by the governmental concession authority; risks borne by the concession company, but substantially supported/limited; risks taken by the concession company. The issue question of risk sharing indeed represents one of the major difficulties for road administrations when setting up concession projects (Flyvbjerg et al., 2003). There are also differences with respect to concession company selection criteria (Domberger and Jensen, 1997). The criteria most frequently quoted by road administrations are the amount of the public subsidy required, the credibility of the financial arrangement, the technical quality of the project, operating strategy and price policy and the reputation of the concession company (inclusion of a construction company amongst its shareholders, etc.).

The introduction of an agency, an autonomous public, or semi-public or private entity, frequently in the context of a concession or franchise arrangement, has the primary advantage of making it possible to impose a management discipline (Ewerhart and Fieseler, 2003). Finally, a toll system can just serve to optimise utilisation of the transport network (traffic spread, intermodal sharing of traffic load, etc.). In this case, however, charge systems must meet a number of different and sometimes contradictory objectives (Zunder and Ibanez, 2004) like marginal cost charging, cost recovery, maximised profit, etc. (Ball et al., 2001). Formulas for determining toll charges also differ throughout Europe ('price cap' method in Italy, traffic band method or availability payment in UK, etc.). Each of these formulas corresponds to a particular level of risk sharing, and it is consequently of genuine interest for all concession authorities in this regard (Cabral and Riordan, 1989). The notion of toll system is often confused with concession and private financing: in a toll system the user is charged and not the tax payer (Burnett and Wampler, 1998). Moreover the European situation differs from American one where there are so few toll motorways ('toll road' or 'turnpike') and mainly built and operated by public authorities (Newbery, 1988).

Before the second world war, in 1921, the word 'Autostrada' was used for the first time in Italy in the Puricelli relation, which presented a plan for a new kind of road, and it was translated literally in other languages as 'autoroute', 'autopistas', 'autobahn' (Caiani, 1924). In 1922 the first highway was opened (Milano-Laghi): from the second world war and after the end of the reconstruction, in 1955 the law N°463 states that highways should finance themselves with a public contribution between 20% and 36%, contribution updated to 52% in 1961 with the law N° 729 but with an unexpected income that should be given to the government after the fifth year and financial costs fixed at 6.5%. New highways (3600 km) were opened by 1970 and with the law N° 492 of 1975 the construction of new highways were forbidden. In Italy, from 1975 until today the prohibition of construction of new highways was partially abrogated in 1978 and legal limits slowed down new construction. The construction of a toll motorways network in Italy started in the 1950s, and was undertaken partly directly by ANAS, the State Department for toll and no-toll motorways, and partly under the terms of franchise contracts. Franchise's costs were assessed by means of the so-called 'Piano Finanziario', the financial plan (PF henceforth) which was to be presented at the beginning of the concession period, and included a detailed forecast for all costs and revenues for the whole period of the concession. The object of the franchise contract is usually the motorway maintenance and the provision of motorways services. In some cases, the franchise contract has also included the construction of new motorways or the enlargement of existing ones. Nowadays, motorways services are provided in Italy by about 20 different concession holders, with the exact number depending on the used definition of motorway. Mostly for historical reasons, concessions holders are very different in nature and size, whatever working definition of size and nature is adopted.

During the 1990s, a radical reform of the sector was undertaken. The two most important changes relate to the ownership of the franchises and the regulatory framework. As to the change in ownership, many franchises were privatised, with the most evident example being the privatisation of Autostrade (now A.S.P.I.–Autostrade per l'Italia), which took place in 1999. However, this was not the only change of ownership for motorways concessionaires in recent years: the number of privately owned franchises increased from 2 in 1992 (or 8, according to the working definition of private ownership) to 12 in 2003 (16, respectively). The other important change refers to the reform of the regulatory regime: the new regulatory framework was defined in December 1996 with the CIPE Directive, which concluded a process that lasted several years. This Directive provided for the renegotiation of all the existing franchise contracts. The new contracts had to adhere to the principles laid out in the Directive, amongst which the main ones are: price regulation based on a price cap formula, with the *X* factor set every five years; cost observation based on the PF, provided by the franchise at the beginning of the franchise contract and being part of the contract itself. The PF is meant to be valid for the whole period of the concession and has to be updated only in special circumstances. The price cap mechanism (4) has been introduced as new regulatory framework:

$$\left[\frac{\sum_i p_i^{\,t} q_i^{\,t-1}}{\sum_i p_i^{\,t-1}{}_i q_i^{\,t-1}} - 1\right] \times 100 \leq \Delta RPI - X + \beta \Delta Q \tag{4}$$

where

ΔRPI is the (expected) change in the retail price index.

X is the offset productivity factor and grants that the price level follows any change in productivity. To avoid reducing the power of the incentives to cost reduction, the X factor should be set equal to expected rather than realised productivity gains and this feature of price cap regulation (Heyes and Liston-Heyes, 1998), with the related fact that the X factor is predetermined for a given number of years, differentiate this form of regulation from Rate of Return (ROR) regulation, where, at least in principle, prices follow closely realised costs.

ΔQ is the composite quality index (in % variation).

β is a scaling positive factor.

p_i^t and p_i^{t-1} are the price paid (per Km) by a vehicle of type i in year t and $t-1$ respectively

q_i^t and q_i^{t-1} are the total number of Km travelled by vehicles of type i in year t respectively

The initial price of tolls has been the result of the initial conditions in the concession, so that it has been set on an individual basis and the variation of tolls of motorways is calculated with the Price Cap formula:

$$\Delta T \leq \Delta - \Delta X + \beta \Delta Q \tag{5}$$

where

ΔP : next year expected inflation

ΔX : capital remuneration, future investment plan (uncertain in income and time of construction), objective of productivities variation (different for each a licensee), expected variation in demand (new alternative)

Q = (Ipav)(0.60) + (Is)(0.40)

Ipav = (Ia1)(0.60) + (Ia2)(0.40)

Ia1 = roughness

Is = number of accidents

Ia2 = regularity

β = value related with the quality of the highways in the last five years.

The price cap formula adopted in the new contracts is applied to the prices charged by the concessionaire to each vehicle belonging to a given class for each km travelled on the motorway. The price cap formula limits the increases of a Laspeyres index of these prices to the rate of inflation, adjusted for expected productivity gains and changes in the quality of services provided.

In the North-East of Italy, AV was established in 1928 in Trieste to design and build the highway from Trieste to Fiume (Rjeka -HR) and in 1965 it started the design and realisation of the Motorway Trieste-Udine-Venezia, in operation since 1966. Now, the concessionaire manages about 200 km of motorways [A4 (Venice-Triest), A23 (Triest-Udin), A28 (Portogruaro-Pordenone-Conegliano)] near the border with Slovenia and Austria.

Due to the changes in the countries near Italy (Slovenia, Croatia, Hungary, etc.), since the middle of 1990 the traffic increased with an unusual trend and the motorway, designed and realised for a different level of service, became less comfortable and safer for users. The concessionaire has planned to invest in the near future a large amount of money in the network upgrade: from 2 to 3 lanes in the stretch from Venice to Villesse. The construction phases will predictably induce the risk of traffic congestions: then the realisation of Intelligent Highways and Intelligent Transport Systems become necessary to support the management in making decisions on the traffic control, especially during emergencies and unusual conditions.

6 An application of the balanced scorecard to motorway system performance assessment related work

In this section we describe how the balanced scorecard model, originally developed for use in the private sector, could be adapted for use in a modern motorway concessionaire to estimate its corporate efficiency and to evaluate environmental and social performance.

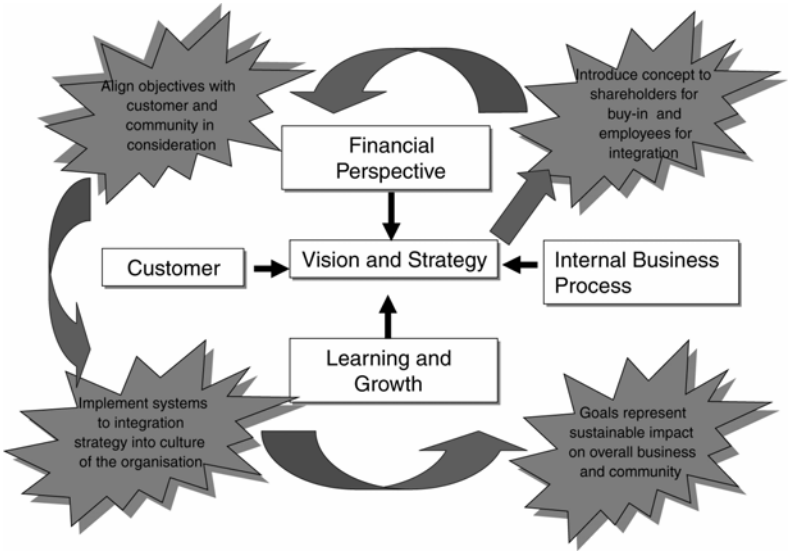
The balanced scorecard is a strategic management system that links performance measurement to strategy using a multidimensional set of financial and non-financial performance metrics. The term 'balanced scorecard' refers to the framework first described by Kaplan and Norton (1992) and further expanded in the Balanced Scorecard (1996) and The Strategy-Focused Organization (2001). In practice, many managers use the term 'balanced scorecard' to refer to any set of financial and non-financial measures that link performance indicators to corporate objectives.

The four perspectives in the balanced scorecard (Figure 1) represent four key components of creating and sustaining corporate value. In addition to the balance achieved by including both financial and non-financial performance indicators, the balanced scorecard helps managers to improve corporate decision making and accountability by including both leading and lagging measures of performance (Dias-Sardinha and Reijnders, 2005).

A performance measurement system is a tool for implementing strategic planning and achieving continuous improvement at all levels of an organisation: the balanced scorecard is an integral part of business planning and strategy. A balanced scorecard system also identifies performance improvement opportunities/targets and highlights the need for business redesign or enterprise processes.

The first step of our framework is to propose our vision (Figure 2) for S.p.A. AV: Corporate Social Responsibility is a way of doing business which goes beyond mere financial results. Therefore, according Vogelsang (2002), AV has to state its own commitment to sustainable development through environmental protection, social responsibility and economic progress. Consequently, AV should define a strategy to achieve these goals and to create a future that engages stakeholders, leverages core competencies and creates superior shareholder and societal value (Knittel, 2002). Finally, AV must develop value-based codes and Corporate Social Responsibility strategies and link them to its own mission, vision and values.

Figure 1 Adapted from 'the balanced scorecard'



Source: Kaplan and Norton (1996).

The mission of AV is to provide, ensuring safety and mobility, a primary service which is by nature deeply connected to its impact on society and the environment in which it operates. These factors will put the issues of social and environmental responsibility at the top of group companies' agendas, which combine public service provision with the goals of creating value and meeting all stakeholders' requirements (Moffat and Auer, 2006). Moreover, the quality of the company's strategy and management and its performance in dealing with opportunities and risks deriving from economic, environmental and social developments can be quantified and used to identify and select leading companies for investment purposes (Bryant et al., 2004). Consequently, in AV corporate sustainability must be an investable concept and its performance shall be crucial in driving interest and investments in sustainability to the mutual benefit of investors (Lazonick and O'Sullivan, 2000). Then, the concessionaire needs to begin to invest in improving behaviour models according to commitments deriving from signing up to the United Nations Global Compact projects, which aims to promote corporate social responsibility with the ultimate goal of building a more sustainable and non-discriminatory global economy (Jamasb et al., 2004).

The new mission shall be to meet the infrastructure needs for the mobility of people, goods, materials and information: it is necessary to work vigorously to integrate different historic businesses into a new corporate culture including the Strategic Plan for Corporate Social Responsibility. This plan in particular must contemplate minimising environmental impact, guaranteeing transparency with the investment community, ensuring the motivation of human resources and their involvement in the continuous improvement of the company, maintaining a close relationship with customers and guaranteeing their satisfaction (Marrewijk, 2004).

There is an opportunity of a new approach named 'Sustainable Value Added – Measuring Corporate Contributions to Sustainability beyond Eco-Efficiency' (Frigge and Hahan, 2004). With it, it is possible to measure corporate contributions to

sustainability called Sustainable Value Added. Value is created whenever benefits exceed costs. Current approaches to measure corporate sustainable performance take into account external costs caused by environmental and social damage or focus on the ratio between value creation and resource consumption. Environmental goals are drivers for long-term growth in profitability as they reduce releases to the environment and rate of waste generation, and improve energy efficiency per unit of production (Lohman et al., 2004).

Figure 2 Adapted from 'the strategy-focused organisation'

Source: Kaplan and Norton (2001).

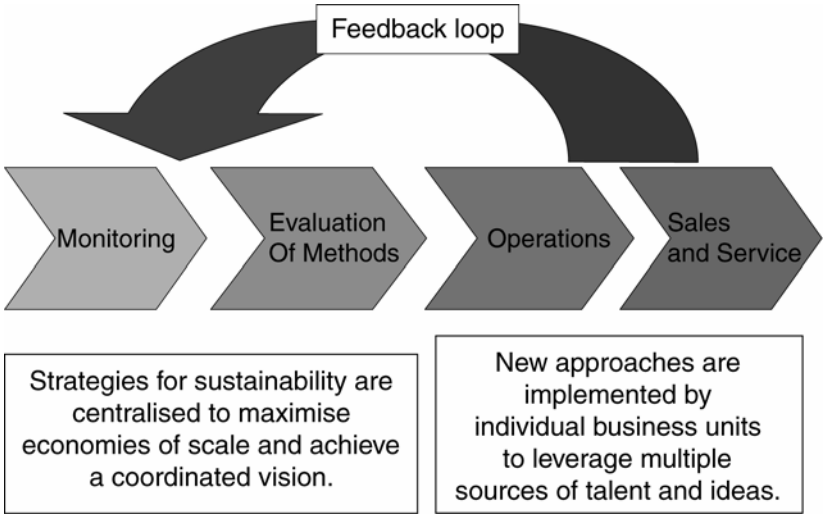
The concept of strong sustainability requires that each form of capital is kept constant. As Sustainable Value Added is inspired by strong sustainability, it measures whether a company creates extra value while ensuring that every environmental and social impact is in total constant. Therefore, it takes into account corporate eco- and social efficiency as well as the absolute level of environmental and social resource consumption (eco- and social effectiveness).

As a result, Sustainable Value Added considers simultaneously economic, environmental and social aspects. The overall result can be expressed in any of the three dimensions of sustainability. But a Sustainable Organisation of this kind is also in reality a Learning Organisation, as described (Figure 3) in the following model (Poell et al., 2000).

AV has to integrate Sustainability into the Core Elements of Business just using a balanced scorecard. Leading indicators are generally thought of as input or process indicators that link more closely to operations, while lagging indicators relate more to outcomes achieved through the management of leading indicators. However, leading and lagging indicators should be thought of as a continuum, or as a part of a complex flow of causes and effects. For example, a facility's toxic emissions are a lagging measure of process efficiency, and also a leading indicator of environmental costs. Employee turnover is a lagging measure of employee benefit expenditures, but a leading measure of recruitment and training costs. To more effectively determine performance measures,

managers must understand the causal links between actions that create organisational capabilities and the impact of those actions on operational performance, customer value, sustainability performance and financial performance. The four perspectives of the balanced scorecard connect, through chains of cause and effect, learning and growth actions impact, internal business process outcomes, internal business process actions impact, both customer and financial outcomes. According to Epstein and Wisner (2001), developing social and environmental balanced scorecard measures helps environmental, health and safety (EH&S) managers identify the key performance factors that link their department work to the company strategic objectives and leading companies recognise the critical importance of systematically and proactively managing corporate, social and environmental impacts. There is no rule for the right number of measures to include in a balanced scorecard, although including too of them tends to distract from pursuing a focused strategy. Generally, a complete balanced scorecard contains three to six measures in each perspective. A rich set of potential measures reflects the complexity of business today. The measurement mix should be a combination of leading/lagging, financial/non-financial, external/internal, strategic/tactical, process/product, people/ technology and input/output measures. Measures chosen for the scorecard should be quantifiable, in either absolute or percentage terms, as well as complete and controllable. 'Complete' in the sense that the measure sums up in one number the contribution of all elements of performance that matter; for example, profitability is a summary measure of revenue generation and cost control. 'Controllable' in the sense that employees in the organisation can actually influence improvement in the measured factor.

Figure 3 Model for sustainable organisation



Finally, for the motorway concessionaire we propose the following Aim and Objectives and the customised balanced scorecard in (Table 1).

Aim: safe motorways, reliable journeys, informed travellers, putting customers first, working together in dynamic teams and partnerships, encouraging learning, innovation and flexibility, delivering effective services that provide value for money, building trust by acting with honesty and fairness.

Objectives: to deliver a high quality service to all customers by improving road safety, making journeys more reliable through better network management and information, respecting the environment, to ensure more effective delivery through better working relationships, to implement best practice and innovative solutions to improve service now and in the future, to be an efficient firm with effective business processes and resource management systems.

Table 1 Balanced Scorecard proposed for a motorway concessionaire (*the motorway specific factors*)

Environmental	*Social*	*Environmental*	*Social*
Financial		*Customer*	
• *Environmental € saved* • € fines/penalties • EH & S cost (% of sales) • % proactive versus reactive expenditure • Increase in relative % of proactive expenditures • *% environmental costs direct- traced* • € capital investments • *Energy costs* • Disposal costs • *Recycling revenues* • *Revenues from* 'green' *product*s • € operating expenditures • Education in cost of debit • *Cost avoidance from environmental actions* • *Reduce costs in terms of life and money of the consequences of accidents*	• Philanthropic € contributed • € workers compensation costs • # employee lawsuits • € employee benefits • Legal actions/costs • Training budgets • reduction in hiring costs • Revenue from socially positioned products • Increased sales from improved reputation • *Reduce costs in terms of life of the consequences of accidents*	• Cause-related marketing • *# 'green' products* • Product safety • # recalls • *Customer returns* • Unfavourable press coverage • % products reclaimed after use • *# stakeholder communications* • *Product life* • *Functional product eco-efficiency*	• *Customer perceptions* # of cause-related events supported (cancer, Aids) • € community support (parks, safety, recreation, etc.) • *# community meetings* • *Customer satisfaction* • *Social report requests* • # product recalls • Customer group demographics • *Understand more in depth the needs of the users* • *Respond to the needs with adequate services*

Table 1 Balanced scorecard proposed for a motorway concessionaire (*the motorway specific factors*) (continued)

Environmental	*Social*	*Environmental*	*Social*
Internal business processes		*Learning and growth*	
• # LCAs performed • *% material recycled* • % waste to landfill • # certified suppliers • *# accidents seven spills* • *# audits seven years* • *# truck miles* • % office supplies recycled • Internal audit scores • *Energy consumption* • % facilities certified • % of product remanufactured • Packaging volume • Non-product output • #supplier audits/year • *Fresh water consumption* • *Greenhouse gas emissions* • *Air emissions* • *Water emissions* • *Vehicle fuel use* • *Habitat changes due to operations*	• *# employee accidents* • # lost workdays • # days work stoppages • Hours overtime work • Average work week hours • € warranty claims • € minority business purchases • # plant tours/visitors • # non-employee accidents • Certifications • # suppliers certified • # supplier violations • *Environmental quality of facilities* • *Observance of international labour standards* • *# safety improvements projects* • *# solutions to avoid crashes and accident* • *# solutions for a better and safer mobility*	• % of employees trained • # training programmes/ hours • Reputations per surveys • *Inclusion in 'green' funds* • # employee complaints • # community complaints • #shareholder complaints • Unfavourable press coverage • # violations reported by employees • # of employees with incentives linked to environmental goals • # of functions with environmental responsibilities • *Management attention to environmental issues* • *% of employees using car pools*	• Workforce diversity (age, gender, race) • Management diversity • # internal promotions • Employee volunteer hours • Average length of employment • # involuntary discharges • Employee education € • # family leave days • € employee benefits • Salary gaps between genders/races • Employee satisfaction • € 'quality of life' programmes • % of employees owning company stock • # applicants/job openings • Employees with disabilities • Employee grievances • Workforce equity

7 Conclusion and future work

Ethics is not a substitute for a fundamentally sound business strategy, and so it is important to provide value-added tools for companies to help them manage all aspects of sustainable and socially responsible business practices.

In order to perform the objective of a Sustainable Value Added in a Strategic Plan for Corporate Social Responsibility, it is very important to define the roles of technological progress, resource substitution, alternate capital valuation, better provision and pricing mechanisms of public goods in enhancing the productivity of existing assets. It is also essential to discover the key features and principles of sustainable development by examining emerging needs, available capitals and productivity capacities of each environment. Business has a responsibility, beyond its basic responsibility to its shareholders, to a broader constituency that includes its key stakeholders: customers, employees, government, the people of the communities in which it operates. Organisational ethics, values and Corporate Social Responsibility initiatives are becoming increasingly important value drivers in corporations and have implications right across the organisation in area such as transportation.

The balanced scorecard model can really be useful to estimate corporate efficiency and to evaluate environmental and social performance in a motorway company. It is possible to improve financial benefits, to reduce operating costs, to enhance brand image and reputation, increased sales and customer loyalty, to increase ability to attract and retain employees, to reduce regulatory supervision.

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References

Apeland, S. and Scarf, A. (2003) 'A fully subjective approach to capital equipment replacement', *Journal of the Operational Research Society*, Vol. 54, pp.371–378.

Atkinson, G. (2000) 'Measuring corporate sustainability', *Journal of Environmental Planning and Management*, Vol. 43, pp.235–252.

Aschauer, D.A. (1989) 'Is public expenditure productive?' *Journal of Monetary Economics*, Vol. 23, pp.177–200.

Aschauer, D.A. (2000) 'Public capital and economic growth: issues of quantity, finance, and efficiency', *Economic Development and Cultural Change*, Vol. 48, pp.391–406.

Ball, R., Heafey, M. and King, D. (2001) 'Private finance initiative – a good deal for the public or a drain on future generations?' *Policy and Politics*, Vol. 29, pp.95–108.

Barber, F. and Strack, R. (2005) 'The surprising economics of a people business', *Harvard Business Review*, Vol. 83, pp.80–92.

Bonetti, M. (2005) 'A generative approach to the development of European cities in the face of globalization', *Paper for the Plenary Session of the ENHR International Conference, "Challenges and Innovations"*, Reykjavik, Iceland, 29 June–3 July.

Bryant, L., Jones, D.A. and Widener, S.K. (2004) 'Managing value creation within the firm: an examination of multiple performance measures', *Journal of Management Accounting Research*, Vol. 16, pp.107–131.

Burnett, J.E. and Wampler, B.M. (1998) 'Unit-price contracts: a practical framework for determining competitive bid prices', *Journal of Applied Business Research*, Vol. 14, pp.63–72.

Cabral, J. and Riordan, M. (1989) 'Incentives for cost reduction under price cap regulation', *Journal of Regulatory Economics*, Vol. 1, pp.93–102.

Caiani, L. (1924) 'La solenne inaugurazione della prima autostrada in Italia', *La Rivista Illustrata del Popolo d'Italia*, Vol. 2, No. 9, pp.1–96

Dias-Sardinha, I. and Reijnders, L. (2005) 'Evaluating environmental and social performance of large Portuguese companies: a balanced scorecard approach', *Business Strategy and the Environment*, Vol. 14, pp.73–91.

Domberger, S. and Jensen, P. (1997) 'Contracting out in the public sector: theory, evidence and prospects', *Oxford Review of Economic Policy*, Vol. 13, pp.67–79.

Epstein, M.J. and Wisner, P.S. (2001) 'Using a balanced scorecard to implement sustainability', *Environmental Quality Management*, Vol. 11, pp.1–10.

Ewerhart, C. and Fieseler, K. (2003) 'Procurement auctions and unit-price contracts', *The Rand Journal of Economics*, Vol. 34, pp.569–581.

Flyvbjerg, B., Bruzelius, N. and Rothengatter, W. (2003) *Mega Projects and Risk. An Anatomy of Ambition*, Cambridge: Cambridge University Press.

Frigge, F. and Hahan, T. (2004) 'Sustainable value added – measuring corporate contributions to sustainability beyond eco-efficiency', *Ecological Economics*, Vol. 48, pp.173–187.

Geddes, M. (2005) 'Neoliberalism and local governance – cross-national perspectives and speculations', *Policy Studies Routledge, Part of the Taylor and Francis Group*, Vol. 26, pp.359–377.

Geerlings, H. and Stead, D. (2002) 'Integrating transport, land-use planning and environment policy in European countries', *European Journal of Transport and Infrastructure Research*, Vol. 2, pp.215–232.

Goodland, R. (1995) 'The concept of environmental sustainability', *Annual Review of Ecology and Systematics*, Vol. 26, pp.1–24.

Gramlich, E.M. (1994) 'Infrastructure investment: a review essay', *Journal of Economic Literature*, Vol. 32, pp.1176–1196.

Greenstein, S., McMaster, S. and Spiller, P. (1995) 'The effect of incentive regulation on infrastructure modernization: local exchange companies development of digital technology', *Journal of Economics and Management Strategy*, Vol. 4, pp.187–236.

Heyes, A.G. and Liston-Heyes, C. (1998) 'Price-cap regulation and technical change', *Journal of Public Economics*, Vol. 68, pp.137–151.

Hukkinen, J. (2003) 'Sustainability indicators for anticipating the fickleness of human–environmental interaction', *Clean Technologies and Environmental Policy*, Vol. 5, pp.200–208.

Jamasb, T., Nillesen, P. and Pollitt, M. (2004) 'Strategic behaviour under regulatory bench-marking', *Energy Economics*, Vol. 26, pp.825–843.

Kaplan, R.S. and Norton, D.P. (1992) 'The balanced scorecard-measures that drive performance', *Harvard Business Review*, Vol. 70, pp.71–79.

Kaplan, R.S. and Norton, D.P. (1993) 'Putting the balanced scorecard to work', *Harvard Business Review*, Vol. 71, pp.134–147.

Kaplan, R.S. and Norton, D.P. (1996) '*The Balanced Scorecard: Translating Strategy into Action*, Boston, MA: Harvard Business School Press.

Kaplan, R.S. and Norton, D.P. (2001) *The Strategy-Focused Organization*, Boston, MA: Harvard Business School Press.

Kopp, A. (2005) 'Aggregate productivity effects of road investment – a reassessment for western Europe', *European Regional Science Association, ERSA Conference Papers with Number ersa05*, pp.631–653.

Kopp, A. (2006) 'Macroeconomic productivity effects of road investment a reassessment for Western Europe', *85th Transportation Research Board Annual Meeting*, 22–26 January, Washington: DC, pp.1–19.

Knittel, C. (2002) 'Alternative regulatory methods and firm effiency: stochastic frontier evidence from the U.S. electricity industry', *Review of Economics and Statististics*, Vol. 84, pp.530–540.

Lado, A. (1992) 'A competency-based model of sustainable competitive advantage: toward a conceptual integration', *Journal of Management*, Vol. 18, pp.77–91.

Lazonick, W. and O'Sullivan, M. (2000) 'Maximizing shareholder value: a new ideology for corporate governance', *Economy and Society*, Vol. 29, pp.13–35.

Linster, M. and Jill, F. (2001) 'Using the pressure-state-response model to develop indicators of sustainability: OECD framework for environmental indicators', *Report for Organisation for Economic Cooperation and Development – Foundations of success*, pp.1–11.

Lohman, C., Fotuin, L. and Wouter, M. (2004) 'Designing a performance measurement system: a case study', *European Journal of Operational Research*, Vol. 156, pp.267–287.

Mayer, M. (2003) 'The onward sweep of social capital: causes and consequences for under-standing cities, communities and urban movements', *International Journal of Urban and Regional Research*, Vol. 27, pp.110–132.

Moffat, A. and Auer, A. (2006) 'Corporate environmental innovation (CEI): a government initiative to support corporate sustainability leadership', *Journal of Cleaner Production*, Vol. 14, pp.589–600.

Nederveen, A.A.J., Konings, J.W. and Stoop, J.A. (2003) 'Globalization, international transport and the global environment: technological innovation, policy making and the reduction of transportation emissions', *Transportation Planning and Technology*, Vol. 26, pp.41–62.

Newbery, D.M. (1988) 'Road damage externalities and road user charges', *Econometrica: Journal of the Econometric Society*, Vol. 56, pp.295–316.

Papadopoulos, Y. (2000) 'Governance, coordination and legitimacy in public policies', *International Journal of Urban and Regional Research*, Vol. 24, pp.210–223.

Poell, R.F., Chivers, G.E., Van Der Krogt, F.J. and Wildemeersch, D.A. (2000) 'Learning-network theory: organizing the dynamic relationships between learning and work', *Management Learning*, Vol. 1, pp.25–49.

Tribe, K. (2006) 'Reading trade in the wealth of nations', *History of European Ideas*, Vol. 32, pp.58–79.

Uri, N. (2001) 'Productivity change, technical progress and efficient improvement in telecommunication', *Journal of Policy Modelling*, Vol. 18, pp.283–300.

Van Den Bergh, J.C.J.M. (1993) 'A framework for modelling economy-environment-development relationships based on dynamic carrying capacity and sustainable development feedback', *Environmental and Resource Economics*, Vol. 3, pp.395–412.

van Marrewijk, M. (2004) 'A value based approach to organization types: towards a coherent set of stakeholder-oriented management tools', *Journal of Business Ethics*, Vol. 55, pp.147–158, Netherlands: Kluwer Academic Publishers.

Vogelsang, I. (2002) 'Incentive regulation and competition in public utility markets: a 20-year perspective', *Journal of Regulatory Economics*, Vol. 22, pp.5–27.

Zunder, T. and Ibanez, N. (2004) 'Road pricing and freight', *Logistics and Transport Focus*, Corby, Vol. 6, p.28.

Key community legislation

Directive 1999/62/EC of the European Parliament and of the Council of 17 June 1999 OJ L 187, 20.7.1999, *On the charging of heavy goods vehicles for the use of certain infrastructures*.

Commission of the European Communities Brussels, 12.9.2001 COM(2001) 370 final, *White Paper European transport policy for 2010: time to decide*.

European Parliament Committee on Regional Policy, Transport and Tourism Final A5-0345/2000 *Report on transport infrastructure charging*, Rapporteur: Paolo Costa.

European Commission COM/2004/0327 final, *Green Paper on public-private partnerships and Community law on public contracts and concessions.*

Oecd *Key Environmental Indicators* 2004.