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ELECTRIC VEHICLES, ENERGY EFFICIENCY, TAXES, AND PUBLIC POLICY IN BRAZIL¹

*José Marcos Domingues & Luiz Artur Pecorelli-Peres**

ABSTRACT²

Within the current global scenario, which strives for energy efficiency and environmental protection, there is discussion of tax incentive possibilities as environmentally-oriented public policy tools, in which taxes are not perceived as a traditional fundraising device (fiscal taxation), but rather through their non-fiscal potentiality (extrafiscality). The suggestions of tax policy models aimed at environmental protection found, as a case study, that the context of electric vehicles in Brazil is that they are the victims of legislation that does not take into consideration the basic principles of physics and ecology and does not envisage the most efficient and less polluting transportation models. Moreover, taking as a reference the successful public policies in other countries, the study proposes measures that include tax incentives for the development of sustainable transport in Brazil and take into account the new paradigm represented by electric vehicles.

Keywords: tax incentives – non-fiscal taxation (extrafiscality) – sustainable development – public policies – energy efficiency – environmental protection – electric vehicle.

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I. INTRODUCTION

By the end of 2009, the Brazilian Government seemed inclined to push for fiscal policies favoring electric vehicles (EVs). Until 2010 words had not become reality, and a momentous opportunity was lost during Rio de Janeiro *Challenge Bibendum*.

During the Brazilian Seminar on Technologies for Electric Vehicles (TEC VE 2011), held in Brasília in June 2011, the Ministry of Finance voiced governmental intentions to compel the auto industry to adopt a seal that ranks vehicles based on emissions and fuel consumption. The time has come for the country to discuss the production of EVs that are powered by less or non-polluting electricity, and would reduce dependence on ethanol³ and gasoline.⁴ In fact, battery EVs, or even plug-ins and hybrids, can use several primary energy sources (solar, wind, hydraulic, etc.) that are impossible for combustion-engine vehicles. Despite the adequacy of the Brazilian energetic matrix for EV expansion, there are institutional barriers that need to be addressed now.

A future step would be using the above-mentioned green seal to grant other incentives, such as reducing the present 25 percent federal VAT⁵ on electric cars, depending on proper cataloging of energy efficiency along

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3. According to the executive secretary of the Finance Ministry, "Discussion of new technologies for the automotive sector remains strong in the world. This process and the [recent] crisis of ethanol became important to put the issue on the table." Martha Beck, *Selo Classificará Veículos por Níveis de Consumo e Emissão de Poluentes* [New Seal Will Classify Vehicles by Levels of Consumption and Emissions], GLOBO.COM (June 20, 2011), <http://oglobo.globo.com/economia/mat/2011/06/20/selo-classificara-veiculos-por-niveis-de-consumo-emissao-de-poluentes-924733486.asp>.
 4. Another initiative would be granting fiscal incentives within the scope of a new Competitiveness Development Policy (Política de Desenvolvimento de Competitividade – PDC) linked to required levels of domestic content of Brazilian-made vehicles. *Id.* In fact, while this essay was being written, on August 2, 2011, the Brazilian government launched the *Plan "Brasil Maior"*, a new industrial policy (under Provisory Measure n. 540, especially articles 5 and 6), in the context of the Competitiveness Development Policy. The policy may encourage scale production of EVs in Brazil, a country that suffers from an unfair heavy tax burden. The lack of public policies for this sector has inhibited the entrance of EVs into the Brazilian sustainable development agenda. Besides credit, the new program will promote tax cuts for automotive manufacturers and auto part industries that come to invest in innovation and nationalization of components; notoriously, EVs represent technology innovation in Brazil and the *brazility* index of domestic production is intended to be a natural development induced by the announced fiscal incentive policy. This policy is in line with the generally acknowledged thinking that "new technologies require, in a certain stage of its development, stimulus to research and to initial demand . . . needing to be organized and supported by governments. As in the case of Brazilian biodiesel, in which action of market stimulus, regulation and tax incentives were complemented by actions of research, laboratorial capacitating and specialized human resource building-up." Sergio Rezende et al., *Os Veículos Elétricos e as Ações do Ministério da Ciência e Tecnologia*, in *ESTRATÉGIAS DE IMPLANTAÇÃO DO CARRO ELÉTRICO NO BRASIL* 13, 26 (Rio de Janeiro: INAE – Instituto Nacional de Altos Estudos 2010).
 5. Tax on industrialized products (imposto sobre produtos industrializados or "IPI").

with emission cleanliness of vehicles in the country, which requirement mix would be the basis for creating fair environmental tax benefits.

This essay discusses the possibilities of environmental protection through *tax incentives* as environmentally oriented public policy tools, in which taxes are not perceived as a traditional fund-raising device (fiscal taxation), but rather through their *non-fiscal* potentiality (*extrafiscality*). Next, the essay presents tax-policy models aimed at environmental protection, a context that also presents the case of EVs in Brazil.

II. STATE PROMOTES ENVIRONMENTAL PROTECTION

Environmental protection evolved into a global issue by the end of the twentieth century, especially in view of mounting worries about the disequilibrium of the greenhouse effect caused by unfriendly human behavior.⁶ Such protection has a special characteristic because the protected “good” shapes the right to a healthy environment, whose holder is undetermined. The beneficiary of this right is humanity, including *those who have not yet been born* (the principle of responsibility among generations).

Notwithstanding ancient biblical wording⁷, which may be construed as environmental precepts, and further regulation throughout time, it is a relatively recent phenomenon that states worldwide have produced massive legislation introducing environmental protection as a matter of serious concern.⁸

In Brazil, during the 1980s, environmental legislation became a positive system. The legislation include the following benchmark laws: Law 6,938/1981 (National Environmental Policy Act); Law 7,347/1985 (Public Civil Action Act); the Constitution of 1988 (with a whole chapter on the Environment); and Law 9,605/1998 (Environmental Crimes Act).

The 1988 Constitution concentrates the constitutional supremacy innate to its normative force.⁹ It superseded both utilitarianism¹⁰ and

6. United Nations Conference on the Human Environment, Stockholm, Swed., June 5-16, 1972, *Declaration of the United Nations Conference on the Human Environment, passim*, U.N. Doc. A/CONF.48/14 (June 16, 1972) (addressing global environmental issues); see JOSÉ MARCOS DOMINGUES, DIREITO TRIBUTÁRIO E MEIO AMBIENTE 2 (Forense 3rd ed. 2007) (giving historical criticism).

7. DOMINGUES, *supra* note 6 (quoting *Genesis* ch. 1).

8. ÉDIS MILARÉ, DIREITO DO AMBIENTE 134 (4th ed. 2005) (quoting the Portuguese Alfonsine, Manueline, and Filippine Ordinations in force in Brazil until the Civil Code of 1916, which also had property-connected environmental rules; the Waters Code of 1934, the Forestry Code of 1965 and the Mining Code of 1967 are examples of legislation with sparse and maybe inadequate environmental rules which were not able *per se* to impede environmental degradation). See PAULO DE BESSA ANTUNES, DIREITO AMBIENTAL 148 (9th ed. 2006); PAULO AFFONSO LEME MACHADO, DIREITO AMBIENTAL BRASILEIRO 61 (14th ed. 2006).

9. See KONRAD HESSE, A FORÇA NORMATIVA DA CONSTITUIÇÃO 15, 20-21 (Sergio Antonio Fabris ed., Gilmar Ferreira Mendes trans., 1991); KONRAD HESSE, ELEMENTOS DE DIREITO CONSTITUCIONAL DA REPÚBLICA FEDERAL DA ALEMANHA 48-49 (Sergio Antonio Fabris ed., Luís Afonso Heck trans., 1998).

10. Nature as a raw material supplier for man's development.

preservationism¹¹ as visions of environmentalism. The Constitution embraces conservationism,¹² thus adhering to the idea of sustainable development.

The Brazilian Constitution,¹³ similar to the Spanish Charter,¹⁴ holds there is a duty on the State to promote environmental protection. Presently, environmental protection, as Germán Orón Moratal puts it, “is not an individual or socially more or less extended desideratum,” but rather a lien, a problem to be solved “inevitably with public financing.”¹⁵ Because environmental protection ought to be considered a public need, and a public need is precisely one to be met by public services and funded by proper allocation of public means, environmental protection should be funded by public means.¹⁶

III. LAW AND SUSTAINABLE DEVELOPMENT

Aside from the symmetry between the words ecology and economics,¹⁷ there is a strong link between environmental protection and the use of natural resources for industrial production and economic development. It does not seem possible to dissociate man and his respective needs from nature. But infinite human needs cannot be a license to destroy the planet.

Conciliation of economic development must include respect for the environment and for human rights; this is the equation that leads to the

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11. Nature is to remain untouched by man, for any human intervention in the environment is deemed to be harmful per se.
 12. Man may and should intervene in natural processes, looking for the necessary elements for development, though respecting other living beings that are part of the environment.
 13. “All have the right to an ecologically balanced environment which is an asset of common use and essential to a healthy quality of life, and both the Government and the community shall have the duty to defend and preserve it for present and future generations.” CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] art. 225 (Braz.).
 14. “Article 45 [Environment] (2) The public authorities shall concern themselves with the rational use of all natural resources for the purpose of protecting and improving the quality of life and defending and restoring the environment, supporting themselves on an indispensable collective solidarity.” CONSTITUCIÓN ESPAÑOLA, B.O.E. [CONSTITUTION] n. 45(2), Dec. 29, 1978 (Spain).
 15. Germán Orón Moratal, *Fiscalidad Ambiental: la Ecotasa*, in V CONFERENCIAS SOBRE EL MEDIO AMBIENTE 9, 10 (2002).
 16. See ALIOMAR BALEIRO, *UMA INTRODUÇÃO A CIÊNCIA DAS FINANÇAS* 2 (14th ed. 1990).
 17. “Ecology” comes from Greek “*oikos*”, meaning “house, home” and “*logos*” (logy), meaning science, study. Thus, *ecology* could be said to mean the science that studies our house, the planet Earth. Another science branch whose vocabulary roots are similar is Economics. It is no mere coincidence: “*oikos*,” which means “house” is complemented by “*nomia*,” meaning management, organization. Therefore, Ecology and Economics are both science branches related to the same object of study, with different respective foci. See ANTUNES, *supra* note 8 (“sadly, many people’s viewpoint is that ecologists and economists are foes with antithetic visions”).

concept of sustainable development.¹⁸

Thus, the Brazilian Constitution fairly provides for environmental protection as a structural element of the economic order, holding incumbent upon the State a mandatory action in favor of sustainable development.

A. ENVIRONMENTAL LAW IN THE 1988 CONSTITUTION AND ITS
CONNECTION WITH SUSTAINABLE DEVELOPMENT;
THE INFRA CONSTITUTIONAL LEGISLATION

Article 225 of the Brazilian Constitution, besides providing for the environment as a public good (“*res communis homini*”), aims at establishing harmony¹⁹ among the provisions that discipline its use by integrating those norms of an economic nature with those intended to protect human rights. Because environmental protection is a fundamental aspect of the economic order, the article provides:

Article 170. The economic order, founded on the appreciation of the value of human work and on free enterprise, is intended to ensure everyone a life with dignity, in accordance with the dictates of social justice, with due regard for the following principles: . . .

VI - environment protection, which may include differentiated treatment in accordance with the environmental impact of products and services and of their respective production and delivery processes[.]²⁰

Thus, the Constitution embraces the argument that neither economic development nor environmental protection are absolute values, but each has a respective relative value recognized in the concept of sustainable development.²¹

This is further evidenced by Law n. 9985/2000, which provides that the National System of Units of Nature Conservation (SNUC) has a goal “to promote sustainable development from natural resources.”²² And, the Constitution of the State of Rio de Janeiro that provides: “In order to guarantee the effectiveness of this right [to enjoy an ecologically healthy environment], the State shall . . . establish tax policies aimed at implementing the polluter-pays principle and at stimulating the development and implementation of technologies for better environmental control and

18. Sustainable development seems to be the harmonization of the permanent tension between economic development and environmental protection: the effective conciliation between development and human quality of life. *See* DOMINGUES, *supra* note 6, at 19.

19. *See* EROS ROBERTO GRAU, *A ORDEM ECONÓMICA NA CONSTITUIÇÃO DE 1988* 255-56 (2d ed. 1991).

20. CONSTITUIÇÃO FEDERAL [C.F.] art. 170 (Braz.).

21. Sustainable development appears in Brazilian statutes in the mid-1990s, even in budget laws and continuously repeated henceforth as a guideline for the Federal Administration, according to the principles of Agenda 21. *See* Lei No. 9.082, de 25 de Julho de 1995, art. 2, V, DIÁRIO OFICIAL DA UNIÃO [D.O.U.] de 26.7.1995 (Braz.).

22. Lei No. 9985, de 18 de Julho de 2000, art. 3-4, DIÁRIO OFICIAL DA UNIÃO [D.O.U.] de 19.7.2000 (Braz.).

reclamation.”²³

Therefore, it is incumbent upon the State to embrace the practical construction of sustainable development, in concert with societal values and wishes, while taking into account important aspects of the economic system. Beyond drafting environmental texts, the State must not fail to establish tax policies in line with the aforementioned task.

B. PUBLIC FINANCE LAW, TAX LAW AND SUSTAINABLE DEVELOPMENT

Economic instruments²⁴ are fundamentally based on the environmental law *polluter-pays principle*,²⁵ which has a positive meaning (polluter imputation of the costs of environmental public services) and a selective meaning (modulating or adjusting said cost imputation according to the intensity of pollution).²⁶

Among the ways to prevent or curb pollution, taxation is an efficient tool to stimulate non-polluting conduct (non-fiscal taxation). These taxes find a legal basis in Hans Kelsen’s premial sanction doctrine based on the retributive principle (*vergeltung*): the State acknowledges the individual’s effort to comply with the law rather than limiting itself to punishing the breach of the law through repressive sanctions.²⁷ This doctrine provides fiscal incentives that otherwise would be deemed to be unlawful privileges vis-à-vis the *equality principle*.

This legal reasoning finds a connection with reasoning developed in Pigou’s economic theory.²⁸ Symmetrically, a typical *Pigouvian* tax is one imposed in situations when market failure or distortions must be fought (or corrected) by taxing (or increasing taxes on) the same and using the proceeds as a subsidy in favor of those of an opposite (adequate or friendly) nature.²⁹

So, both legal and economic doctrines favor the use of State measures to induce human conduct consistent with social values. In the case of

23. CONSTITUIÇÃO DO ESTADO DO RIO DE JANEIRO [CONSTITUTION] art. 261, §1 (Braz.).

24. See JOSÉ MARCOS DOMINGUES, *Biofuels, Megacities, and Green Taxes*, in 7 *CRITICAL ISSUES IN ENVIRONMENTAL TAXATION* 283-294 (Heng Lye et. al. eds., 2009).

25. “Ce principe est inspiré par la théorie économique selon laquelle les coûts sociaux externes qui accompagnent la production industrielle (dont le coût résultant de la pollution) doivent être internalisés, c’est-à-dire pris en compte par les agents économiques dans leurs coûts de production.” MICHEL PRIEUR, *DROIT DE L’ENVIRONNEMENT* 89 (2d ed. 1991). Note that the greater the cost share born by the polluter, the greater the adherence to the polluter-pays principle. See ORG. FOR ECON. CO-OPERATION AND DEV., *THE POLLUTER-PAYS PRINCIPLE: DEFINITION, ANALYSIS, IMPLEMENTATION* 6 (1975).

26. See JOSÉ MARCOS DOMINGUES, *DIREITO TRIBUTÁRIO E MEIO AMBIENTE* 17-27 (3d. ed. 2007).

27. See HANS KELSEN, *TEORIA PURA DO DIREITO* 48-49 (A. Amado ed., João Baptista Machado trans., 5th ed. 1979).

28. See A.C. PIGOU ET AL., *UN ESTUDIO SOBRE HACIENDA PÚBLICA* [A Study in Public Finance] 149 (Gonzalo Guasp trans., 1974).

29. See CRISTIANE DERANI, *DIREITO AMBIENTAL ECONÓMICO* 90-91 (3d ed. 2008); see also LOÏC PHILIP, *FINANCES PUBLIQUES* 42 (4th ed. 1992).

economic choices, those ought to be consistent with environmental goals inasmuch as these are perceived as social values protected by law.³⁰ Green taxes are technically designated environmental taxes. The label “green tax” refers to taxes that have environment-friendly motivation.³¹

Aside from their fundraising function, when taxes are referred to as fiscal or financial (*finanzsteuer*) taxation (hence, fiscal revenues), which correspond to a non-regulatory state policy, taxes may exercise great influence over economic activity—they are one of the main costs of businesses.³² In this sense, taxes are referred to as non-fiscal or extra-fiscal taxation because they do not necessarily aim to raise funds for public expenditure (some would aim at no tax collection at all as the true tariff barrier).³³ Instead, the goal of non-fiscal taxation is to direct the economy and focus on political goals. Non-fiscal taxes are also regulatory taxes, taxes d’orientation, or *marktordnungsabgaben*, because, in the words of Xavier Oberson, as *zwecksteuern*, they are “money having the goal of affecting taxpayers’ attitudes.”³⁴

Application of environmental taxes may have a fiscal function (corresponding to the positive meaning of the polluter-pays principle) and a non-fiscal function (in the selective meaning of the principle), even though they are both essentially regulatory in nature. The main goal of environmental taxes is to change the taxpayers’ (businesses and consumers) behaviors, producing or enhancing environmental awareness: this is the domain of a specific environmental public policy, specifically, fiscal public policy.

IV. THE CONCEPT OF PUBLIC POLICY

Public policy is an expression from political science³⁵ that brings to law

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30. See Alejandro Altamirano, *La Tributación como Instrumento Aplicado al Mejoramiento del Medio Ambiente*, in FACULTAD DE CIENCIAS ECONÓMICAS, UNIVERSIDAD NACIONAL DE CÓRDOBA, ECO TRIBUTACIÓN: ANALES DE LAS XXVII JORNADAS DE FINANZAS PÚBLICAS § 1.7-1.8 (1994); see also RAMÓN MARTÍN MATEO, DERECHO AMBIENTAL 100-103 (1977); WILLIAM D. RUCKELSHAUS ET AL., THE ENVIRONMENTAL PROTECTION SYSTEM IN TRANSITION: TOWARD A MORE DESIRABLE FUTURE: FINAL REPORT OF THE ENTERPRISE FOR THE ENVIRONMENT 35 (1998).
31. These taxes may be understood as having both a broad and a narrow meaning. The broad meaning of an environmental tax is that of an ordinary or traditional tribute adapted so as to benefit environmental protection efforts. The narrow, or strict, meaning is that of a new, separate tribute charged on the use of the environment by economic actors.
32. Taxes may be used as an indirect regulatory (*ordnungsteuer*) economic instrument. For example, an activity or product that is highly taxed may be discontinued in favor of activities subject to lower tax rates.
33. HEINRICH WILHELM KRUSE, DERECHO TRIBUTARIO: PARTE GENERAL 68-69 (Perfecto Yebra Martul-Ortega & Miguel Izquierdo Macias-Picavea trans., 3d ed. 1978).
34. XAVIER OBERSON, LES TAXES D’ORIENTATION: NATURE JURIDIQUE ET CONSTITUTIONNALITÉ 23-24 (1991).
35. Cf. Maria Paula Dallari Bucci, *Buscando um Conceito de Políticas Públicas para a Concretizaçã o dos Direitos Humanos*, in DIREITOS HUMANOS E POLÍTICAS PÚBLICAS 5 (Renato Cymbalista ed., 2001), available at <http://www.comitepaz.org.br/>

a trend of *interdisciplinarity*, thereby combining the common roots of ethics from the different branches of human knowledge.

Ronald Dworkin³⁶ designated “‘policy’ [as] that kind of pattern which establishes a goal to be reached, in general an improvement in certain economic, political or social aspect of the community.” This is different than a principle, “an exigency of justice or equity or some dimension of morality,” or even a fundamental judgment of value.³⁷

In Brazil, Professor Fabio Comparato³⁸ teaches that “. . . policy appears, after all, as an activity, i.e., as an organized set of norms and acts leading to *the fulfillment of a given goal* The policy, as a set of norms and acts, is unified by its goal.”

Thus, public policies ought to be seen as State actions integrated by legislative and administrative activities that produce norms and acts oriented to a given goal.³⁹

In particular, aside from a strong regulatory character, fiscal public policies have a high potential for the coordination of several levels of state action, usually materialized through public budgets ordering account en-

download/
Direitos%20Humanos%20e%20Pol%C3%ADticas%20P%C3%ABlicas.pdf.

36. RONALD DWORKIN, *LEVANDO OS DIREITOS A SÉRIO* 36 (Martins Fontes ed., Nelson Boeira trans., 2002).
37. See OSWALDO ARANHA BANDEIRA DE MELLO, *PRINCÍPIOS GERAIS DE DIREITO ADMINISTRATIVO* 404, 406 (2d ed. 1979).
38. According to Comparato, and based on the fundamental teachings of Karl Loewenstein (1957), the goal (teleology) of conduct must be considered both in State actions (the public policies) and in peoples’ acting (the acts of juridical life). See Fabio Comparato Konder, *Ensaio Sobre o Juízo de Constitucionalidade de Políticas Públicas*, 737 *REVISTA DOS TRIBUNAIS* 17, 18 (1997) (Braz.).
39. As Comparato puts it, “History gives us several examples of *Directing States*, of a mercantilist, industrialist or warmonger.” See *id.* at 16-17. In this sense, public policies have always been produced: the Romans formed their legions by seducing their members with promises of early retirement and the granting of agricultural lots. See Antonio Lima Ribeiro, *Problemas estruturais da previdência social no Brasil*, 175 *ESPAÇO ANCEP – ASSOCIAÇÃO NACIONAL DOS CONTABILISTAS DAS ENTIDADES DE PREVIDÊNCIA*, Feb. 23, 2008 (Braz.); see also SILVIO AUGUSTO DE BASTOS MEIRA, *DIREITO TRIBUTÁRIO ROMANO* 56-58 (1978). In the Antiquity and in the Medieval Age, Muslims charged relatively more expensive taxes on Christians, and vice-versa; the latter imposed them on Muslims, in their respective moments in power, sure of “the possibility of promoting the faith through the villainous metal.” See SÉRGIO VASQUES, *OS IMPOSTOS DO PECADO* 21-22 (1999) (quoting Ibn Abi Al-Qayrawani, who adds: “. . . not-Muslims . . . thereby overtaxed. This way conversions are promoted and nonbelievers are made to pay for maintenance and expansion of Islam”). The treaties of friendship, commerce, and navigation that the neo-colonial powers imposed on Japan by the end of the XIX century, guaranteeing them minimal import tariffs, extraterritoriality of their laws, and Consul jurisdiction undoubtedly meant a policy of economic domination, the vector of which was the *opening* of markets in favor of (then) already industrialized countries. See YOSIYUKI NODA, *INTRODUCTION TO JAPANESE LAW* 41 (Anthony H. Angelo trans., 2d ed. 1977); HIDEO TANAKA, *THE JAPANESE LEGAL SYSTEM* 194-95 (3d ed. 1971); JOHN WHITNEY HALL, *JAPAN: FROM PREHISTORY TO MODERN TIMES* 257 (C.E. Tuttle Co. ed., 1971); José Marcos Domingues, *Aspectos da Influência do Direito no Desenvolvimento Japonês*, 279 *REVISTA FORENSE*, n. 28, 1982, at 45-76.

tries, which ultimately show or express public policies themselves.⁴⁰

Here, taxation may play a strategic and fundamental role. Taxes in general, and environmental taxation in particular, have a strong regulatory potential, which may enhance sustainable development and environmental protection.

V. TAX BURDEN ON ELECTRIC VEHICLES IN BRAZIL⁴¹

Besides a generally acknowledged overall tax burden of more than 35 percent,⁴² not followed by corresponding efficient public services in Brazil, EVs suffer from a bottleneck tax cost: they are taxed at 25 percent by federal VAT⁴³—the same rate applied to the most polluting combustion motor run vehicles (electric motorcycles pay 35 percent). EVs are also subject to the general state VAT,⁴⁴ which is between 18 and 19 percent; besides, they are taxed at 11.6 percent again by federal *social contributions*⁴⁵ on gross sales. Moreover, there is a yearly state vehicle tax⁴⁶ of up to 4 percent.⁴⁷ All of these federal and state taxes have a taxable basis

40. Article 174 of the Brazilian Constitution provides for mandatory public planning as guidance for the private sector. CONSTITUIÇÃO FEDERAL [C.F.] art. 174 (Braz.).

41. For a summary of the Brazilian tax system, see José Marcos Domingues, *An Introduction to The Brazilian Tax System*, 44 *KOBE U. L. REV.* 19, 23-24 (2010).

42. “[I]t is possible to suppose that the tax burden reached 36.2% of GDP at mid-2011.” See José Roberto Afonso & Marcia Monteiro Matos, *Termometro Tributario Brasileiro* [Technical Note: Brazilian Tax Thermometer], JOSE-ROBERTOAFONSO.COM.BR (July 26, 2011), <http://www.joserobertoafonso.com.br/attachments/article/1964/TermoTribJun2011.pdf>. “For this year [2011], . . . the tax burden should grow to 34.9% [of GDP], due to the end of IPI fiscal incentives and companies’ income tax recovery which fell in 2010, as a consequence of the 2009 crisis.” See Amir Khair, *Estimativa da Carga Tributaria 20101* [sic] [Tax Burden 2011], JOSE-ROBERTOAFONSO.COM.BR (May 2011), <http://www.joserobertoafonso.com.br/attachments/article/1261/CT%202011%20-%20Khair.pdf>.

43. Industrialized products tax (“IPI – imposto sobre produtos industrializados”). CONSTITUIÇÃO FEDERAL [C.F.] art. 153, § IV (Braz.). “In Brazil, electric vehicles do not receive a differentiated treatment. In the case of ‘IPI’, electric vehicles fall within the category ‘others’, on which the tax rate is the highest. An electric car, for example, is taxed at 25%.” See *id.*; see also Luciano Galvao Coutinho et al., *Veículo elétrico, políticas públicas e o BNDES: oportunidades e desafios* [Electric Vehicle, Public Policies and the BNDES: Brazilian Economic and Social Development Bank: Opportunities and Challenges], in *ESTRATEGIAS DE IMPLANTAÇÃO DO CARRO ELÉTRICO NO BRASIL* 33 (2010).

44. Tax on “transactions relating to the circulation of goods and to the rendering of interstate and intermunicipal transportation services and services of communication” (“ICMS – imposto sobre a circulação de mercadorias e services”). CONSTITUIÇÃO FEDERAL [C.F.] art. 155, § II (Braz.).

45. “PIS-Cofins,” or taxes (contributions), for the social integration plan and for the financing of social security, respectively. CONSTITUIÇÃO FEDERAL [C.F.] art. 149, 239 (Braz.). Lei No. 10.485, de 3 de Julho de 2002, *DIÁRIO OFICIAL DA UNIÃO* [D.O.U.] de 7.4.2002 (Braz.) (establishing specific rates).

46. Tax on the ownership of automotive vehicles (“IPVA—imposto sobre a propriedade de veículos automotores”). CONSTITUIÇÃO FEDERAL [C.F.] art. 155, § III (Braz.).

47. Out of twenty-seven States, a minority seven States have exempted EVs; others, like São Paulo, may charge 3 percent, whereas Rio de Janeiro charges 1 percent, and Mato Grosso do Sul interestingly allows for the Executive to reduce the 2.5 percent to 3 percent tax by 70 percent in order to fulfill programs of pollution control, or technological development, with reference to motor vehicles powered

that is the market value of the vehicle. On the other hand, there is no rebate or tax incentive related to the purchase of an EV in the tax system. Such a tax burden makes it virtually impossible for EV industrialization and trade in scale, preventing their use in cleaning air pollution, especially in large cities. Global sporting events programmed for 2012, 2014, and 2016 may be opportunities to see EVs on the agenda of sustainable development in Brazil.

Noteworthy are the municipal taxes on real estate relating to the infrastructure required for the use of EVs (recharging stations, repair shops, and services rendered therein), including, for example, an annual 2.8 percent tax on the market value of non-residential real estate in Rio de Janeiro and usually between 2 percent and 5 percent of the service price on the rendition of services.⁴⁸

There is no income tax incentive or financial subsidy provided by law for manufacturers and consumers of EVs.

The Rio de Janeiro State University (UERJ) developed a pioneer partnership between the law and engineering departments, leading to legislative policy proposals by its Nucleus for Studies on Public Finance, Taxation, and Development (NEFIT), in favor of the domestic production and consumption of EVs. Tax incentives and subsidies ought to be put in practice in Brazil, ranging from federal taxes to state and municipal taxes. Presently, NEFIT interacts with the Laboratory of Public Policies and Fiscal Fairness (LAPPJUS) of UERJ.

In order to justify said legislative proposals, the Group of Studies on the Electric Vehicle (GRUVE) at UERJ has prepared the following technical case study.

VI. EV TECHNOLOGY CLAIMING FOR PUBLIC POLICIES

A. THE CASE STUDY

The previous rationale is conducive to the argument that the Brazilian Federation needs to adopt public policies, at the federal, state, and municipal levels, aimed at promoting sustainable development by including fiscal incentives in the country's tax legislation to encourage research and development in new vehicle technologies, particularly electrical technology.

by electricity or gas. In the case of an ethanol-run motor vehicle, the reduction can be up to 40%. To sum up, only around 1/3 of Brazilian States allow any kind of tax differentiation in favor of EVs. Lei No. 13.296, de 26 de Dezembro de 2008, DIÁRIO OFICIAL DE SÃO PAULO [D.O.S.P.] de 12.27.2008 (Braz.); Lei No. 2.877, de 22 de Dezembro de 1997, DIÁRIO OFICIAL DO RIO DE JANEIRO [D.O.E.R.J.] de 23.12.1997 (Braz.); Lei No. 1.810, de 22 de Dezembro de 1997, DIÁRIO OFICIAL DE MATO GROSSO [D.O.M.S.] de 23.12.1997 (Braz.).

48. PEDRO HUMBERTO BRUNO DE CARVALHO JR., DISTRIBUTIVE ASPECTS OF REAL ESTATE PROPERTY AND ITS TAXATION AMONG BRAZILIAN FAMILIES 44 (2009); KPMG, THINKING BEYOND BORDERS: BRAZIL 4 (2011), available at <http://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/thinking-beyond-borders-2011/ies-tbb-2011-brazil.pdf>.

Federal government data is presented in order to identify, in the Brazilian energy matrix, and in atmospheric emission indices for the transport sector, arguments that will make the case for greater encouragement of EVs. Impacts of current atmospheric pollution levels on the health of the population are also addressed.

Finally, some avenues for legislative modifications that will reduce the costs of EV production and maintenance are proposed.

B. ATMOSPHERIC EMISSIONS OF THE TRANSPORT SECTOR

A major element aggravating climate change is the increased concentration of carbon dioxide — CO₂ — in the atmosphere. If emissions of this type of gas are to be reduced, we will necessarily have to review the transport sector, a source of energy that, in Brazil, is based particularly on fossil fuels. This sector is the second major source of CO₂ emissions.

Transport emissions are increasing in urban areas. The 2010 census showed that 84 percent of the Brazilian population lives in cities.⁴⁹ By and large, vehicle emissions prevail. In Rio de Janeiro, for instance, in 1998, according to a study by the Pereira Passos Institute, the percentage of transport sector emissions reached 61 percent.⁵⁰ Currently, this number is beyond 80 percent, if we include motorcycles, which hardly ever have catalyts.

Creating incentives for EVs will reduce transport sector emission levels. Two facts underpin this argument:

- (i) within the transport sector, the highest polluting level corresponds to the road vehicles (Table 1); and
- (ii) CO₂ emissions from cars are major pollutants, totaling 35 percent (Table 2).

Table 1: CO₂ Emissions in Brazil's Transport Sector

Modal	CO ₂ t/year	Participation (%)
Roadways	138,768,000	90.41%
Air	7,999,000	5.45%
Maritime	4,279,000	2.91%
Railways	1,803,000	1.23%
Total	146,849,000	100%

Source: Emissions Inventory, Ministry of Science and Technology, 2009

49. *2010 Census Results*, INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (Nov. 29, 2010), http://www.ibge.gov.br/english/presidencia/noticias/noticia_visualiza.php?id_noticia=1766&id_pagina=1.

50. CESAR EPITACIO MAIA & AYRTON ALVARENGA XEREZ, INVENTARIO DE EMIS-
SOES DE GASES DO EFEITO ESTUFA DA CIDADE DO RIO DE JANEIRO 41 (2000),
available at http://portalgeo.rio.rj.gov.br/protocolo/pcontrole/documentos/capitulo_2_parte2.pdf.

Table 2: CO₂ Emissions per Vehicle Type in Brazil

Vehicle Type	Percentage (%)
Natural Gas	3.0
Heavy Truck	30.0
Medium Truck	4.0
Light Truck	1.0
Highway Bus	3.0
Urban Bus	14.0
Diesel Light Commercial	3.0
Otto Light Commercial	4.0
Motorcycles	3.0
Cars	35.0
Total	100%

Source: National Inventory, Ministry of Environment, 2011, baseline year 2009, page 66.

The above tables show the need for an effort that will change the structure of the Brazilian road sector, noticeably by means of introducing EVs. In the case of hybrid EVs (those having internal sources of energy to recharge their batteries), emissions are significantly less than in vehicles powered exclusively by fuels. According to tests conducted by the UERJ, in a research and development (R&D) project approved by the Board of the National Electricity Regulatory Agency (ANEEL), battery-only EVs use one third of the energy required for a conventional internal combustion vehicle. Outstandingly, apart from carbon dioxide, which greatly impacts climate change, there are pollutants that are very aggressive to human health, namely carbon monoxide, nitrogen oxides, particulate matter (PM), volatile organic compounds, and aldehydes, all of which are present to a greater or lesser degree in conventional vehicles, including dual-fuel vehicles.

C. ENERGY MATRIX

Brazil has immense hydroelectric potential and the possibility to explore other abundant sources of energy (biomass, wind, and solar). Given the promising exploration of oil & gas pre-salt findings, it is necessary to modify the current utilization of primary energy sources to significantly increase the production of fossil fuels and ethanol to supply traditional vehicles. Without a public policy for EVs, it is not a sound strategy. The penetration of EVs allows for more efficient uses of fossil energy and sugar cane availability, transforming part of it into electricity, even if it is deemed necessary, in the most unfavorable situation, to supplement the needs of the power mix (Table 5). This will reduce the amount of energy for transportation and CO₂ emissions in coming years, because electricity is more efficient, as demonstrated in many interna-

tional analyses.⁵¹ EVs are extremely versatile: they recharge from various sources of energy, which is not the case for internal combustion vehicles.

Attention should be drawn to the dimensions of the transport sector in the final energy consumption grid in Brazil. Considering the baseline year of 2009, the transport sector ranked as the second major energy consumer in Brazil (responsible for 28.6 percent of the total energy produced in the country), with the first being the industrial sector (consuming 40.7 percent) (Table 3).

Table 3: Sector Participation in Final Energy Consumption in Brazil 2009

Sector	Percentage (%)
Road Transport	26.1%
Residential	10.5%
Energetic	11.0%
Agriculture	4.3%
Commercial	2.8%
Public	1.7%
Industrial	34.6%
Railroads, Airways and Waterways Transport	2.2%
Others	6.8%
Total	100%

Source: National Energy Balance 2010, baseline year 2009, executive summary, page 23, Energy Research Company – EPE / Ministry of Mines and Energy – MME

Since the 1970s, the transport sector has presented a permanent trend of increasing energy consumption, according to the previously mentioned National Energy Balance 2010, with a baseline year of 2009. There is also an overriding awareness that fossil fuels are the main source of energy used in this sector, representing 79.6 percent of the total amount available. Meanwhile, cleaner sources, such as hydroelectricity (which has major participation), are left with minimum consumption rates (0.2 percent), according to Table 4.

51. See JAMES LARMINIE & JOHN LOWRY, *ELECTRIC VEHICLE TECHNOLOGY EXPLAINED* 265 (2d ed. 2003).

Table 4: Sources of Energy Consumption by Transport Sector in Brazil 2009

Power Source	Percentage (%)
Gasoline	24.3%
Electricity	0.2%
Ethyl Alcohol	20.2%
Natural Gas	3.2%
Diesel Oil	52.1%
TOTAL	100%

Source: National Energy Balance 2010, baseline year 2009, executive summary, page 73. Empresa de Pesquisa Energética (EPE) [Energy Research Company]/The Ministry of Mines and Energy (MME)

The situation is even more frustrating when statistics on the evolution of sector-consumption of oil by-products and electricity, for example in 1973 and 2006, are compared. Participation of oil by-products in the transport sector rose from 45.4 percent in 1973 to 60.5 percent in 2006—a 33 percent growth!⁵² Conversely, participation of electricity in the transport sector, which was low enough in 1973, dropped from 2.4 percent to 1.7 percent (a 29 percent decrease, considering the sector segments under analysis).⁵³ That situation, particularly considering the low levels of electric power consumption, shows that the Brazilian energy potential, set aside for electric transportation, is truly underused, including its many other applications.

Additionally, Brazil has one of the largest electric power potentials in the world and 76.9 percent⁵⁴ of the electricity generated in the country is hydroelectricity, meaning it comes from a renewable primary source, as shown in Table 5, where generation supply capacity is included in accordance with the primary source used.

52. Rocio Sanchez Zapata, *Impacto en la Demanda de Energia Electrica en Colombia Debido a la Penetracion de Vehiculos Híbridos-Eléctricos y Eléctricos* (June 2009) (unpublished thesis, Universidad Nacional de Colombia) (on file with Biblioteca Sede Medellín, Universidad Nacional de Colombia).

53. *Id.*

54. The portions concerning imports refer primarily to the Brazil-Paraguay Itaipu Binacional Company and to the Small Hydroelectric Plants (“SHP”).

Table 5: Structure of Internal Supply According to the Nature of the Primary Source of Electric Power Generation – Brazil 2009

Power Generation	Percentage (%)
Coal	1.3%
Oil Products	2.9%
Natural Gas	2.6%
Wind	0.2%
Biomass	5.4%
Nuclear	2.5%
Imports	8.1%
Hydro > 30MW	76.9%
Total	100%

Source: National Energy Balance 2010 baseline year 2009, page 12
 Empresa de Pesquisa Energética (EPE) [Energy Research Company]/
 The Ministry of Mines and Energy (MME)

D. TRANSPORT SECTOR IMPACTS ON HEALTH

Another argument favoring the introduction of EVs, and consequent reduction in pollutant and gas emissions, are the high public health costs incurred by air pollution, which, as already stated, are directly connected to transportation.

In that regard, the in-depth study developed by São Paulo University's Experimental Atmospheric Pollution Laboratory (USP) provides an indispensable contribution: a report entitled "Assessing Environmental, Health and Socio-Economic Aspects Involved in Six Metropolitan Regions."⁵⁵ This study analyzes, from various perspectives, the environmental impact caused by atmospheric pollution and shows, perhaps most significantly, the costs of the damage caused by this type of pollution. These results were made available to the mass media and posted on a number of websites, including a report based on the USP study entitled "Pollution costs U.S. \$1 billion per year to Brazil,"⁵⁶ that stated "the poor quality of the air costs at least U.S. \$1 billion to the Brazilian treasury every year, particularly due to deaths and treatment of diseases that are

55. This is a 421 page study developed jointly with the Laboratory for the Analysis of Atmospheric Processes (LAPAt), the Department of Atmospheric Sciences, and the Institute of Astronomy, Geophysics, and Atmospheric Sciences, USP, whose "Version 0" is dated April 22, 2009. Inst. of Astronomy, Geophysics, and Atmospheric Scis. & LAPAt, Assessing Environmental, Health, and Socio-Economic Aspects Involved in Six Metropolitan Regions (Apr. 22, 2009) (unpublished study).

56. See, for instance, *Poluição custa US\$ 1 bilhão por ano no país* [Pollution Costs \$1 Billion a Year in Country], ABVE, <http://www.abve.org.br/destaques/destaque08094.shtml> (last visited Mar. 15, 2013), and *Poluição custa US\$ 1 bilhão por ano ao Brasil* [Pollution Costs \$1 Billion a Year to Brazil], CICLISTA URBANO CWB (July 24, 2009), <http://ciclistaurbanocwb.wordpress.com/2009/07/24/poluicao-custa-us-1-bilhao-por-ano-ao-brasil/>.

directly or indirectly associated with pollution.”⁵⁷ According to that report, metropolitan regions that spend the most on overall health and air quality-related health problems is led by São Paulo (U.S. \$300 million), followed by Rio de Janeiro (U.S. \$250 million), Porto Alegre (U.S. \$180 million), Belo Horizonte (U.S. \$150 million), Curitiba (U.S. \$140 million), and Recife (U.S. \$10 million).⁵⁸ The report further states: “Besides treatment values per se, such as hospitalization costs, the formula calculates indirect factors associated with the diseases: sick leaves, how the absence of an employee affects a company’s production and finances, reduced taxes, disruption of family stability, among others.”⁵⁹ More than just an environmental problem, the high levels of air pollution in Brazilian cities have become a true public health risk, affecting thousands of people per year, aggravating countless cases of respiratory diseases and, eventually, incurring high health care costs for the State.

E. AVENUES TOWARDS CHANGE AND FIRST SIGNS FROM PUBLIC AUTHORITIES

Although EVs are a significant factor in reducing CO₂ emissions in Brazil, interest in producing EVs nationally is still mild. Part of this paradox lies in the fact that investments in EV technology in the country are currently not attractive.⁶⁰

First, investing in technology research and development (R&D) is an expensive and risky process, which calls for much reflection. Additionally, many automotive manufacturers doing business in Brazil have started their R&D projects at parent-company labs abroad, and not in Brazil.

Second, the current heavy tax burden demands investments that are even higher and, therefore, riskier. When it comes to emerging EV technology, the issue is further aggravated by high technology costs and unreasonable taxation, which means the final price of an EV produced and marketed in Brazil will be far higher than that of vehicles powered by fossil fuels which rely on older technology and long-standing (cheaper) knowledge. This is true albeit that fossil-fuel-run vehicles are far less efficient, and cause more environmental damage.

57. According to the same news that information refers to the six Brazilian metropolitan regions. *Poluição custa US\$ 1 bilhão por ano no país*, *supra* note 57.

58. *Id.*

59. *Id.*

60. “According to national car manufacturers, the national market would not have enough of a demand to absorb a considerable number of electric cars to pay for the investment in technology for this area, plus the high price that this technology adds to the final product, even in major world markets.” *Brasil não tem demanda para investimento em carros elétricos, segundo as montadoras* [Brazil Has No Demand for Investment in Electric Cars, According to the Makers], NOTÍCIAS AUTOMOTIVAS (Sept. 8, 2008), <http://www.noticiasautomotivas.com.br/brasil-nao-tem-demanda-para-investimento-em-carros-eletricos-segundo-as-montadoras/> (author’s translation).

Brazil's entry into this highly competitive market is no simple task, and it will demand efforts from all sides, particularly from Brazil's government through public policies. But one may now say that, in the global playing field, Brazil may miss major opportunities if it does not have a strategic plan in place.

Several countries are taking a head start by investing in research, encouraging car-assembling facilities, or creating other types of favorable conditions to develop an automotive industry based around the electric car. For the sake of illustration, these countries include German investments in EV technology,⁶¹ U.S. investments of around \$2.4 billion by the Obama administration in projects for the development of batteries and electric cars,⁶² British Prime Minister Gordon Brown's call for electric cars in his green policy,⁶³ and Portugal's subsidies to buyers of electric cars (which may reach as much as € 5,000).⁶⁴

Research developed by the UERJ Electric Vehicles Studies Group (GRUVE) entitled *Quantitative Levels of Efficiency and Emissions from Vehicle Propulsion Systems*⁶⁵ points to the need for change in automotive taxation in order to encourage the penetration of EV technology. This change is complex because of the variety of vehicles in the market and their associated primary energy sources. A proposal must be made so that both specific energy consumption, expressed in kJ/km, and vehicle emission levels, particularly carbon dioxide, expressed in kg of CO₂/km, be addressed by fair legislation that rewards the most efficient and low-emitting vehicle. Several technical considerations are necessary; for instance, internal combustion vehicles running on biodiesel, from a CO₂/km emission perspective, are comparable to battery-powered vehicles, because both do not impact climate change. The same would be true for ethanol.

Table 6 contains a classification focused on consumption per km, as indicated in the aforementioned study, considering types of vehicles that use the same platform or model to enable a uniform comparison, which attributes for battery powered EVs 100 percent, or in a per unit base the

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61. See *Alemanha quer se tornar líder mundial de carros elétricos* [Germany Wants to Become World Leader in Electric Cars], GLOBO.COM (Aug. 19, 2009), <http://g1.globo.com/Noticias/Carros/0,,MUL1273168-9658,00-ALEMANHA+QUER+SE+TORNAR+LIDER+MUNDIAL+DE+CARROS+ELETRICOS.html>.
 62. Michael Graham Richard, *Obama Announces \$2.4 Billion in Grants for Batteries and Electric Cars*, TREEHUGGER (Aug. 5, 2009), http://www.treehugger.com/corporate-responsibility/obama-announces-24-billion-in-grants-for-batteries-and-electric-cars.html?dcite=daily_nl.
 63. Andrew Grice, *Brown's Electric Dream for Britain*, INDEPENDENT (Apr. 8, 2009) <http://www.independent.co.uk/news/uk/politics/browns-electric-dream-for-britain-1665349.html>.
 64. *Ultra-Green Europe Slow To Buy Electric Vehicles*, FORBES (May 4, 2012), <http://www.forbes.com/sites/eco-nomics/2012/05/04/ultra-green-europe-slow-to-buy-electric-vehicles/>.
 65. Luiz Artur Pecorelli Peres et al., *Níveis Quantitativos de Eficiência e Emissões de Sistemas de Propulsão Veicular* [Quantitative Levels of Efficiency and Emissions Vehicle], in IV CONGRESSO BRASILEIRO DE EFICIÊNCIA ENERGÉTICA [IV BRAZILIAN CONGRESS ON ENERGY EFFICIENCY] (2011).

value equal to 1.⁶⁶

Table 6: Relative Consumption per km Comparison of Various Types of Vehicles

Vehicle Types (Power Sources)	Relative Energy Consumption (Electric Vehicles = 1,0)
Electric	1.0
Parallel Hybrid Electric Vehicle (PHEV)	2.5
Series Hybrid Electric Vehicle (SHEV)	2.8
Gas – Internal Combustion Engine (ICE)	2.9
Biodiesel - Internal Combustion Engine (ICE)	2.95
Diesel - Internal Combustion Engine (ICE)	3.3
Compressed Natural Gas	3.9

In Table 7, as indicated in the GRUVE study, a performance comparison is presented in terms of CO₂/km. This Table does not consider CO₂ emissions for EVs and internal combustion vehicles running on biomass.

Table 7: Emissions from Vehicles Powered by Non Renewable Fuels

Vehicle Types (Power Sources)	Kg (CO ₂ / Km)
Electric	0
Parallel Hybrid Electric Vehicles (PHEV)	0.2
Series Hybrid Electric Vehicles (SHEV)	0.23
Gas – Internal Combustion Engine (ICE)	0.24
Diesel - Internal Combustion Engine (ICE)	0.24
Compressed Natural Gas	0.25

The composition of these indices provides the fairest and most accurate attribution of the merits of each vehicle type.

In Brazil, planning new guidelines for levying taxes on vehicles is difficult and attempts have been made since 2008, when the partnership began at the UERJ between the school of law and the school of engineering.⁶⁷ This initiative has enjoyed collaboration from other entities, such as the Brazilian Electric Vehicle Association and the National Institute of Energetic Efficiency.

At the time this article was written, Brazilian authorities were well aware of this movement in favor of EV technology and have recognized the need for political initiatives in this direction. Along with considering

66. *Id.*

67. Jose Marcos Domingues & Luiz Artur Pecorelli Peres, *Veículo elétrico, políticas públicas e impostos* [Electric Vehicles, Public Policy, and Taxes], *MONITOR DIGITAL* (Jan. 22, 2010), <http://www.monitormercantil.com.br/index.php?pagina=Noticias&Noticia=73694&Categoria=OPINI%C3%83O>.

the merits of levying taxes on vehicles, the government adds a third component that shall interact with the fiscal incentive: the introduction of national technology content for vehicles produced by means of the Competitiveness Development Policy (PDC) program, which is already employed in the production of tablets.⁶⁸ The plan has been in the hands of the economic team since the Lula administration and now begins in earnest, due to the recent ethanol supply crisis. According to the Executive Secretary for the Ministry of Finance, this is a timely moment for Brazil to discuss manufacturing hybrid vehicles, which pollute less and reduce domestic dependence on ethanol and gasoline.⁶⁹

As it may be observed, the framework being developed shall be used in the near future, and UERJ expects to continuously contribute in the process by bringing together the fields of law and engineering.⁷⁰

VII. LEGISLATIVE PROPOSALS

In order to adapt its tax system to minimize the tax cost for production and consumption of EVs, Brazil should take a series of legislative measures to induce, or at minimum not hamper, domestic initiatives in this sector.

At the federal level, income tax, IPI-value added tax, and social contributions ought to be reduced for an initial period of time (between ten to fifteen years) to allow for reasonable investment amortization. The proposals below should not be construed as tax cuts, because at present there is no EV scale production or imports into Brazil. The only exception are the income tax incentive proposals, which may represent a tax bonus, in lieu of direct governmental subsidies or grants.

68. “The government will force the automotive industry to adopt a label classifying vehicles according to emission levels and fuel consumption. The idea is part of a strategy to improve the quality of national cars and encourage manufacturers operating locally to invest in less polluting and more efficient technologies.” Beck, *supra* note 4 (emphasis added).

69. “The discussion on new technologies for the automotive sector is still fierce in the world. This process and the ethanol crisis have renewed the importance of bringing the subject back to the agendas,” he stated. The new label combines the other two existing labels: the *green note* issued by Ibama, (Brazilian Environmental Agency) concerning the level of polluting emissions, and the *energy efficiency indicator* by Inmetro’s (Brazilian Institute of Metrology) Vehicle Labeling Program. It will not be mandatory right away. The industry shall have some time to adapt. The label is expected to be used in 2012 models. Another way to improve the quality of Brazilian cars should come from tax incentives. In the Competitiveness Development Policy (“PDC”), which will be announced in the coming months, the government will define a rule that will grant tax credits to the production of vehicles with greater national content, in line with tax incentives to electro-electronic products, such as tablets.” *Id.* (The ethanol crisis referred to above took place in 2010-2011 when Brazilian domestic production was insufficient to meet domestic demand and prices went up; in 2011 Brazil was forced to import 4 billion liters of ethanol from the US) (emphasis added).

70. *See Cria o Laboratório de Políticas Públicas e Justiça Fiscal* [Laboratory Creates Public Policy and Fair Taxation], UNIVERSIDADE DO ESTADO DO RIO DE JANEIRO (May 9, 2011), http://www.boluerj.uerj.br/pdf/aeda_00132011_09052011.pdf.

A. SUGGESTED INCOME TAX DEDUCTIONS FOR COMPANIES

Suggested income tax deductions for companies are as follows:

- Companies taxed on “real profit” should be allowed to deduct from the tax amount due, up to 10 percent of the amount invested in the purchase of EVs, limited to R\$ 20,000.00 per EV.
- As an exception,⁷¹ companies taxed on “presumed profit” should be allowed a tax credit of R\$ 20,000.00 per EV purchased, which should be set off against the tax amount due in the year of the respective purchase.
- Companies manufacturing EVs should be granted an income-tax-free treatment on profits from sales of government certified EVs and respective spare parts.

To stimulate equipment acquisition, renovation or modernization of the EV assembling industry would be granted a yearly 20 percent accelerated depreciation limited to the respective asset cost.

Individual consumers would be allowed a maximum deduction⁷² of R\$ 10,000.00 (or US\$ 6,250.00 or € 4,200) from gross revenues in relation to the acquisition of EVs, motorcycles, and tricycles, limited to 20 percent of the total cost of each vehicle.

As for IPI, industrial product VAT, insofar as the tax basis is the market price/cylinder capacity/fuel, the immediate suggested legislative measure is to *zero* the current tax rates of 25 percent (electric cars⁷³) and 35 percent (electric motorcycles⁷⁴). Because EVs do not fall under a specific vehicle type (ordinary cars are taxed at rates from 7 percent to 25 percent⁷⁵), they are treated as “others.” A second step would be a dual tax-basis system (half related to market price/cylinder capacity, fulfilling the ability-to-pay principle; and half related to energy-efficiency and emissions levels, fulfilling the polluter-pays principle applied to environmental taxation). According to the latter criterion, zero-emission EVs would be at least *half* tax-free.⁷⁶ The criteria for modulating the latter half tax bur-

71. Decreto No. 3.000, de 26 de Março de 1999, DIÁRIO OFICIAL DA UNIÃO [D.O.U.] de 26.3.1999 art. 526 (Braz.), available at <http://www.jusbrasil.com.br/legislacao/ anotada/2792040/art-526-regulamento-do-imposto-de-renda-de-1999-decreto-3000-99> (disallowing tax incentive credits when the taxpayer is taxed on the basis of presumed profit).

72. See *id.* art. 83. An individual’s income tax deductions in Brazil are quite few, such as self-employed professional’s expenses, taxpayers’ dependents (including alimony), medical expenses, educational expenses, and contributions to both public and private social security plans. *Id.*

73. Decreto No. 6.006, de 28 de Dezembro de 2006, Diário Oficial da União [D.O.U.] de 8.01.2007 (approving the table of IPI tax rates for electric cars) (Braz.).

74. *Id.*

75. Decreto No. 4.317, de 31 de Julho de 2002, Diário Oficial da União [D.O.U.] de 8.01.2002 (Braz.); Decreto No. 6.006, de 28 de Dezembro de 2006.

76. See Decreto No. 4.317, de 31 de Julho de 2002. The criteria for modulating the latter half tax burden should derive from a combination of indices shown in Part VI above, that is, energy consumption, expressed in kJ/km, and vehicle emission levels, particularly carbon dioxide, expressed in kg of CO₂/km, addressed by fair legislation that rewards the most efficient and less emitting vehicle.

den should derive from a combination of indices shown in Part VI above (energy consumption, expressed in kJ/km, and vehicle emission levels, particularly carbon dioxide, expressed in kg of CO₂/km), addressed by fair legislation that rewards the most efficient and lowest-emitting vehicles.⁷⁷

Japan also undertook studies to modernize vehicle taxation. Aside from an initial policy of subsidies⁷⁸ to induce the purchase of EVs, the country has had a policy of reducing and exempting taxes on vehicles related to energy efficiency and reduction of emissions. Electric cars and hybrid cars have been exempted from the “national tax on the weight of vehicles,”⁷⁹ while those running on fuels have been allowed to pay between 50 percent and 75 percent less taxes once they meet or pass fuel-efficiency and emission-reduction standards ahead of certain deadlines.⁸⁰ In September 2010, a new comprehensive vehicle taxation proposal was submitted to the government⁸¹ focusing on introducing the concept of emissions as a modulation factor for fair taxation in the global warming context.

As for PIS-COFINS (11.6 percent social contribution charged on gross revenues from vehicle sales), as an exception, EV taxation ought to be brought down from its present special rate to *zero* or at least to 3.65 percent, which is the ordinary rate⁸² for such taxation.

At the state level, the “ICMS” (VAT) on vehicles is established at a

77. Similar legislation, though focused on emissions, has been implemented in some European jurisdictions. Portugal has significantly improved air quality standards as acknowledged by the recent OECD Environmental Performance Review 2011. “Overall, revenue from environmentally related taxes has stabilizes at a level below that of the late 1990s. . . . As explained below, reduced revenue from vehicle taxation in the 2000s is the main factor underlying this trend Following the 2007 reform, both the registration tax on vehicle purchases and the annual circulation tax are now differentiated on the basis of CO₂ emission levels and cylinder capacity, with the former gradually becoming more important.” ORG. FOR ECON. CO-OPERATION AND DEV., OECD ENVIRONMENTAL PERFORMANCE REVIEWS: PORTUGAL 2011 42 (2011).

78. See José Marcos Domingues, *O Japão e o Veículo Elétrico: Menos Impostos* [Japan and the Electric Vehicle: Less Tax], MONITOR DIGITAL (Oct. 21, 2010), <http://www.monitormercantil.com.br/index.php?pagina=Noticias&Noticia=86600>.

79. *Id.*

80. *Id.*; See José Marcos Domingues, *Tax System and Environmental Taxes in Brazil: The Case of the Electric Vehicles in a Comparative Perspective With Japan*, 59 OSAKA UNIV. L. REV. 37, 55 (2012); see also MINISTRY OF THE ENV'T, 低公害車の導入に対する税制上の優遇措置制度 [TAX INCENTIVE SCHEME FOR THE INTRODUCTION OF LOW-EMISSION VEHICLES] (2012), available at <http://www.env.go.jp/air/car/mado/gaiyo.pdf>.

81. See generally MINISTRY OF INTERNAL AFFAIRS & COMMC'N, 自動車関係の課税制度の検討, *Jidōsha kankei zeisei nikansuru kenkyū-kai hōkoku-sho no gaiyō*, [RESEARCH COMMITTEE SUMMARY REPORT ON AUTOMOTIVE RELATED TAXATION SYSTEM] (2010), available at http://www.soumu.go.jp/main_content/000082120.pdf#2.

82. See *Contribuição para o PIS/PASEP e COFINS*, RECEITA FEDERAL, item 390, “a” and “c,” in <http://www.receita.fazenda.gov.br/PessoaJuridica/DIPJ/2004/PergResp2004/pr363a430.htm> (last visited Mar. 15, 2013).

general rate of 18 percent.⁸³ The National Council for Tax Policy has allowed topic reductions of this rate under article 155, § 2, XII, “g” of the Constitution, to reduce the final tax burden on basic consumption food-stuff down to 7 or 8 percent of the respective consumer price.⁸⁴

States also charge an annual “IPVA” property tax on vehicles, ranging from 0.5 percent to 4 percent of the respective market value.⁸⁵ Some states have already exempted EVs. It is proposed that all twenty-seven states proceed accordingly as a first step, as main Japanese prefectures, like Kanagawa, Kyoto, and Tokyo, have done;⁸⁶ and then, as a second step, implement a dual tax-basis system (half related to market price, fulfilling the ability-to-pay principle; and half related to emissions, fulfilling the polluter-pays principle applied to environmental taxation). According to this latter criterion, zero-emission EVs would be at least *half* tax-free.⁸⁷

Municipalities charge two taxes which can be greened in favor of EVs: the annual property tax on urban real estate (2.8 percent tax on the market value of non-residential real estate⁸⁸ in Rio de Janeiro, for example), and the service tax on the rendition of services in general (in Rio de Janeiro, rates usually range from 2 percent to 5 percent on the service price).⁸⁹

Taxes ordinarily imposed on real estate include those properties used as assembling plants, EV-charging stations, and EV workshops, and on related services rendered therein, respectively.

As a common practice, municipalities have granted ten-year-long property tax exemptions for strategic businesses interested in establishing in given cities. This tax expenditure can only be legitimate in view of predicted increases of economic activity, services, jobs, and income, thus

83. Some States, like Rio de Janeiro, have instituted an additional 1 percent charge to fund poverty-fighting programs. KPMG, *GLOBAL INDIRECT TAX: BRAZIL 2* (2012), available at <http://www.kpmg.com/Global/en/services/Tax/GlobalIndirectTax/Documents/vat-gst-essentials-2012/brazil-2011-vat-gst-essentials.pdf>.

84. *Id.* at 3.

85. Juliana Mello, *Everyday Taxes in Brazil: IPVA, IPTU and IPTR*, *BRAZIL BUS.* (Mar. 29, 2012), <http://thebrazilbusiness.com/article/everyday-taxes-in-brazil-ipva-iptu-and-iptr>.

86. See ORG. FOR ECON. COOPERATION AND DEV. & INT’L ENERGY AGENCY, *EV CITY CASEBOOK: A LOOK AT THE GLOBAL ELECTRIC VEHICLE MOVEMENT 39* (2012), available at <http://www.iea.org/evi/evcitycasebook.pdf>; Toshio Aritake, *Japan Set to Extend Tax Relief, Subsidies to Electric Vehicles, Solar Power Generation*, *BLOOMBERG BNA* (Nov. 13, 2008), http://climate.bna.com/climate/document_newsarchive.aspx?ID=128444&hhterm=RmluYW5jZQ%3D%3D&hhtype=QWxsV29yZHM%3D.

87. See Decreto No. 4.317, de 31 de Julho de 2002.

88. Lei No. 691, de 24 de Dezembro de 1984, *DIÁRIO OFICIAL DO RIO DE JANEIRO* [D.O.E.R.J.] de 24.12.1984 (Braz.).

89. See Lei No. 3.691, de 28 de Novembro de 2003, *DIÁRIO OFICIAL DO RIO DE JANEIRO* [D.O.E.R.J.] de 28.11.2003, as amended by Lei No. 5.106, de 11 Novembro de 2009 *DIÁRIO OFICIAL DO RIO DE JANEIRO* [D.O.E.R.J.] de 21.11.2009 (Braz.).

generating future growth of tax revenues.⁹⁰ So it is proposed, in favor of the emerging EV industry, that exemptions be allowed for real estate involved with manufacturing and repairing EVs, as well as charging stations and workshops. Additionally, service tax exemptions ought to be granted to services surrounding the EV market, such as designing and repairs.

VIII. Final Remarks

In Brazilian cities with more than 500,000 inhabitants, the most significant cause of air pollution is pollution generated from automotive vehicles.⁹¹

This is a situation to be addressed by efficient public policy. In federative Brazil, this means integrated federal, state, and municipal public policies.

Since the *Brundtland Report* (1987), produced in the wake of the 1972 UN Conference on the Environment, sustainable development has been the key concept for environmental policies worldwide. Brazil has constitutionally committed to such a trend as the country has signed several international conventions and protocols to this effect.

The Brazilian tax burden on EVs has been criticized and suggestions have been made in order to allow for EV production and consumption in line with the foregoing analysis. Brazilian tax laws inhibit technological innovation and research, new business activities, job generation, and future optimization of tax revenues; they now deserve tax incentives, among other public policy measures.

Because the Brazilian energy matrix is one of the cleanest in the world, meaning electrically powering EVs is not environmentally disruptive, and considering the momentum generated by the international events scheduled to take place in the country, such as the 2014 Fédération Internationale de Football Association (FIFA) World Cup and the 2016 Olympic Games, the authors believe the time has come for a Brazilian plan in favor of EVs, and that Rio de Janeiro must lead the movement.

It is not only a negative contribution to global warming that is at stake; it is the rescue of life itself, and of surmounting resource losses in an emergent economy. These goals have moved the authors to join in interdisciplinary research, in which non-fiscal taxation has proved to be a worthwhile measure.

90. "As to non-fiscal exemptions, they will only be legitimate if intended to protect constitutionally significant values such as relative equality, employment, soil productive occupation and development, environmental protection, etc., so as to enhance future well-being and increment of wealth as well the ability to pay taxes of those indirectly and teleologically targeted by them." See JOSÉ MARCOS DOMINGUES, *CAPACIDADE CONTRIBUTIVA: CONTEUDO E EFICACIA DO PRINCÍPIO [ABILITY TO PAY: CONTENT AND EFFECTIVENESS OF THE PRINCIPLE]* 120 (2d ed. 1998).

91. See INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, *PERFIL DOS MUNICÍPIOS BRASILEIROS – MEIO AMBIENTE 2002* 147 (2002), available at http://www.ibge.gov.br/home/estatistica/economia/perfilmunic/meio_ambiente_2002/meio_ambiente2002.pdf.

With a solid technological basis, the right tax incentives may become a suitable tool in favor of socio-environmental awareness and responsibility. EV taxation in Brazil has proved to be a strong case in favor of such a public policy approach. The country urgently needs a green tax reform in favor of less pollution, especially in Brazil's big cities where so many depend on public transportation.