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A Proposal for the Pollution Management Reform in Lithuania: "Pollution currency" Approach (part 1)

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The idea of a universal "pollution currency" that should be used for "payments" for the right to emit specified types of pollutants into air or water is introduced. It is argued that the universal and transferable emission coupons (UTEC) concept actually integrates the main advantages of emission taxes and marketable pollution permits systems, while avoiding some of their less desired qualities.

> *"Numerous opportunities exist to improve environmental protection and natural resource management with incentive-based policy reforms, but they must be assessed on a case-by-case basis"*
> *(Project 88/Round II, U.S. Congress)*

1. THE BACKGROUND

1.1. Environmental Policy in Lithuania

Prior to the Restoration of Independence in 1990, the instruments used for the environmental policy in Lithuania were of the command-and-

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control type. They consisted mainly of the strict but not too vigorously pursued environmental standards – emissions and ambient concentrations – and occasional subsidies for industry for environmental purposes. Theoretically, the violation of the established environmental standards could instigate such sanctions as penalty, obligatory compensation of damage, and – in exceptional cases – temporary or permanent close up of the polluting firm. In reality, however, the magnitude of penalties was limited by the violators "ability to pay" and it was often difficult to extract them. The cases of the suspension or closing of the polluting enterprises were virtually unknown.

However, it should be noted that strictly regulatory approach to the environmental management was perfectly in tune with the general pattern of the command-and-control type of economy. Apparently, in those circumstances every other environmental policy would have been even less effective.

The political events of 1990–1991 opened the possibilities for the revision of both the economic and environmental management principles. The main obstacles that impeded both the advance and the quality of reforms were the lack of *time*, *funds* and *knowledge*, necessary for thorough and comprehensive preparation of introduced changes[1]. Nevertheless, a number of important laws on environmental protection were adopted in Lithuania during the past five years, the most important among them in terms of environmental management reform were "The Law on Environmental Protection (adopted in 1992)", "The Law on Charges for the State Natural Resources (1991)" and "The Law on Taxes on Environmental Pollution (1991)". The latter two introduced what was supposed to become the core of the environmental policy enforcement mechanism in Lithuania – natural resource use charges and emission taxes.

[1] The vivid example of this is embedded in the "Lithuanian Law on Taxes on Environmental Pollution" (see *The Environmental Protection in the Republic of Lithuania* (Vilnius, 1992): the relative charges for the different pollutants wer_ calculated according to the 8 years old Soviet " Temporary methodics..", that itself was being revised in Moscow at that time.

Here is a brief summary of the economic instruments of environmental policy enforcement currently used in Lithuania.

User charges, i.e. payments for the collective or public treatment of effluents, in Lithuania are levied on the use of public wastewater treatment systems and on the collective sludge or oil waste utilization.

Both subsidies and fiscal incentives are forms of the financial stimulus to the economy subjects with an intention either to help them to comply with the imposed requirements or to facilitate the nature-favorable behavior. There are used two kinds of ***environmental subsidies*** in Lithuania: direct and indirect. Direct subsidies come from the state budget funds, earmarked for environmental purposes. Indirect subsidization can be identified in the possibility of exemption from pollution tax liability, foreseen by the law on pollution taxation (will be examined later), and in the preferential state credit rates for the environmentally oriented projects.

Two types of ***fiscal incentives*** are used as well: positive and negative. The established preferential profit tax rate of 15% (compared to the regular 29%), is available to the firms that are recycling/utilizing wastes, producing environmental equipment, etc. It is a *positive* fiscal incentive, promoting environmentally sound behavior. An examples of *negative* fiscal incentives are high custom duties on export of some natural goods (mushrooms, snails).

Deposit-refund system in Lithuania so far was almost exclusively[2] limited to the beverage glass containers. Although exact data on it's performance is not available, it is a fair guess that the major number of a refundable used bottles is returned for the cash refund (paradoxically, economic situation contributes to this result – via the "scavenging for bottles", exercised by poor people). Noteworthy that recycling of a beverage glass containers in Lithuania isn't regulated by law. The glass collection system is operated entirely by the private firms (that explains

[2] Another attempt to use deposit-refund system that is based on the "in kind" type of refund could be recognized in the local producer's offer of a discount price for a new galvanic cell if the same type of a used one is returned to the seller.

the observable differences – up to 60% – in prices offered for returned bottles by the different operators). However, the system excludes most of the imported bottles and, what is increasingly worrisome due to the ever growing quantities of their import, beverage cans.

The stated objective of ***charges for*** the use of State owned ***natural resources*** was "to increase the responsibility of the users for efficient and economical utilisation of the national wealth put at their disposal, and to compensate the expenditures made by State on investigation of natural resources and on the measures implemented for the preservation of the quality and amount thereof"[3]. To keep in accordance with this statement, the charge rates for the use of oil, gas, various minerals and water were established on the basis of State incurred costs of their investigation and initial utilisation, plus the additional charge on the use of national wealth (the ammount of the latter is obtained by the rather intricate calculations, based on the price of oil). It is not the purpose of this paper to analyze in detail the performance of these charges, however, it can be asserted that with respect to, at least, first part of their stated goal the natural resource use charges failed to fulfill their duty.

Lithuanian law on ***pollution taxation*** opens with a rather promising statement, manifesting the intentions of it's authors: "Taxes on pollution serve as an economic element of environmental protection which stimulates pollution abatement and reduce the harmful impact on environment"[4]. Unfortunately, both the taxation scheme itself and the socio-economic circumstances of it's realization contributed to the reality,that felt by far short of this stated noble objective.

Two types of emission standards are defined in the pollution taxation scheme: maximum permitted emissions (MPE) and temporary per-

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[3] "The Lithuanian Republic Law on Taxes on the State Natural Resources" The Environmental Protection in the Republic of Lithuania, Information Bulletin, No 1 (1992), p. 20.

[4] Ibid, p. 24.

mitted emissions (TPE). The formers are defined as the maximum permitted quantity of pollutants, that, if emitted into environment by a stationary polluter, does not exceed the established ambient quality standards (taking into account the impact from the other polluting sources). Those ambient quality standards for atmosphere are established as an allowable concen-trations for an airborne pollutants, the allowability determined by the lack of clinical response in humans after 30 minutes of exposure. For the water pollutants those quality standards are based either on the assimilative capacity of water body, or, for a short list of pollutants (BOD, suspended solids, nitrogen, phosphorus and oil), on their treatment threshold levels at the biological treatment plants. TPEs are the relaxed emission standards, based on technological pollution control possibilities of polluter and "fixed for a definite period – until the GPP is reached"[5].

Three types of a tax rates per one ton of pollutants, emitted into air or water, are stipulated by the Law: (1) *basic* rate, applied if subjects emissions are kept at the MPP (TPE) level; (2) *increased* – if emissions exceed the standard; and (3) *reduced* – if emissions are bellow the GPP standard. While the basic rate is fixed, the magnitudes of the other two vary with the level of emissions above or below the standard. Formulas for the calculation of the actual tax rate for the given level of emissions are provided in the Appendix. Note that for the pollution up to the half of the established GPP norm no tax is charged, and that, in case of the atmosphere pollution, increased tax rates are different for power and industrial plants – for the latters the penalty rate is considerably higher.

Basic and reduced taxes are included in the production costs of a polluting plant. Penalties, instead, are to be paid from it's profit – that makes them even more punishable.

The procedure of payment of taxes is as follows: the estimated annual ammount of payments under the basic rate is paid in quarter installments in advance every three months. At the end of a year the ac-

[5] "The Lithuanian Republic Law on Taxes on the State Natural Resources" The Environmental Protection in the Republic of Lithuania, Information Bulletin, No 1 (1992), p. 24.

tual amount of emissions done is identified and the obligations of the polluter are recalculated. If the actual annual amount of emissions exceeds the standard, polluter additionally pays the sanction, if the other way round – gets the refund. 70 percent of all taxes collected under basic and reduced rates goes into the Municipal Environmental Funds[6], the other 30 percent – to the State budget. All collected penalties are to be deposited into the State Nature Protection Fund.

As it was already stated elsewhere[7], Lithuanian pollution management system is a **mixed** one, that is, contains elements of various origins, including:

a) *emission taxes* – economic type of instrument;

b) *emission standards* – direct regulatory type of instrument; and it should be added:

c) *subsidies* – indirect subsidization is reflected in the provision of the Law, that stipulates the exemption from taxation (for a period of up to 3 years) of those polluters who are implementing abatement measures, designed to cause at least 25% rate of pollution reduction.

One of the specific features of Lithuanian pollution taxation scheme is that the highly progressive penalty rate is applied to ***all*** pollutant discharged, not just to the excess[8]. Thus, the sanction for the violation of the standard is calculated as the difference between the emission amount times the appropriate increased tax rate and the basic charge payment. Under these provisions, the penalty rate for the excess emissions jumps violently to at least double level (for power plants, for industry it is fivefold) and grows quite rapidly afterwards. This indicates that the implicit intention

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[6] Due to their wide spatial range of pollution impact, several largest Lithuanian plants divide their payments in a slightly different way: cement factory "Akmencementas", Mazeikiai Oil refinery, fertilizers plant "Achema" and Kedainiai Chemical plant are splitting their payments 50:50 between the State budget and Municipal funds. State Regional Power Plant (situated between Vilnius and Kaunas) – 90% and 10% accordingly.

[7] Harrington, W. Air and Water Quality Permitting in Lithuania. Working paper, Harvard Institute for International Development, Cambridge(Mass.), 1993.

[8] This enables to interpret the tax rate curve described in the Appendix as a non-monotonous "right to emitt" *supply* curve.

of the system was to discourage any transgression of the established standard. Much more important is that it also demonstrates inconsistency of the Lithuanian effluents taxation scheme with the *necessary* condition of a cost-effective allocation of the pollution-control burden – that *the marginal cost of control should be equated* among all the sources that are exercising it. Under the present scheme pollution sources with different marginal control-cost curves can end paying vastly different marginal abatement costs, while emitting the same amount of pollutant.

Hence, the *modus operandi* of Lithuanian pollution taxation system is effectively pre-determined: it works as a ***"tax decorated" command-and-control system***, suffering from all the characteristic drawbacks: rigidity, low adaptability to the situation changes, economic inefficiency.

The vivid illustration of it is a complete failure of the system to provide an incentives for the pollution abatement efforts – although that was stated as an original intention of the scheme. Due to the rapid inflation (382% in 1991 and 1163% in 1992) and the stability of the initially (in the appendix to the Law) set tax rates, the latters lost their incentive role nearly at the moment of introduction. In addition to that, their correction appeared to be a very problematic procedure, due to the bad mistake made by the environmental policy makers – to include the table of the tax rates as an appendix to the Law. Consequently, it could be changed only by the decision of the same body, which adopted the Law, i.e. by the Parlament. Taking into account that the lawmakers then were (and, in a way, still are) extremely busy with the transformation of a legal system into the "market favorable" one, it is no wonder that the indexation of the emission tax rates had to wait for it's turn until October of 1992.

Adopted then indexation coefficient – 7, while the inflation's index during the period amounted to 10, by itself could be taken as an indicator of the policy priorities in Lithuania. Furthermore, to evade the previous "lock-in" situation, it was established, that the tax rates shall be revised every 3 months and shall be adjusted by the coefficient equal to 0.7 of inflation rate, observed during the past quarter. In fact, this

constituted the slow but inevitable "depreciation" of the emission's tax rates: if, say, at the beginning of a year it was 1, then at the end of a year with an annual 40% inflation it's relative value would diminish to 0.92.

In the light of the said above one would expect that even the "draconian" penalty system wouldn't be sufficient to prevent the widespread violation of the pollution standards. However, the data shows that this is not the case: most sources are keeping within the established emission limits, and the rate of total amount of basic charges to total of sanctions was just about 4:1 in 1992, and 6:1 in 1993–1994[9].

The explanation for that could be twofold. First, the emission standards (GPP or TPP) establishment procedure, as described above, most of the times comes solely to the fixation and legalization of the previous emission levels, that is, those standards by no means could be considered stringent. Second, the mentioned above decline of the economic activity certainly "helped" the sources to cope with some of the environmental requirements.

Thus, the system is environmentally "effective", but not because of it's own properties: the pollution taxes, despite the initial claim, have just the "revenue raising" effect. (And modest at that, too – the amount of collected charges comprises less than 0.2% of State revenues).

The economic decline factor, however, especially the irregularity of operations ("stop-go" mode), gave rise to the different sort of problems for the pollution sources management. Recall that the due payments of tax are estimated a year in advance, and that the total sum should be paid in quarter installments throughout the year. Thus, as it was reported by the representative of the "Achema" Chemical plant at the Seminar on Industrial Pollution Permitting in Central and Eastern Europe (Vilnius, Lithuania, November 16–17, 1993), it is not an exception that the source ends with dutifully paid full quarter installments while it doesn't exercise the major part of it's right to pollute. No possibility of

[9] Calculations based on the data provided by the Economic Division of the Ministry of Environmental Protection of Lithuania.

transfer of the "unused" part of the previous quarter payment to the next one is foreseen by the Law. The same goes for the "unused" right to emit – it is not allowed "to bank" it until better times[10]. Financially all this can be rather inconvenient for a firm which is "budget-minded" – the overpaid sums carry quite a high opportunity costs (the average bank interest rate in Lithuania is still around 20%).

Thus, it can be concluded that:

1) The originally conceived Lithuanian pollution taxation scheme was evidently aimed at the achievement of the *unconditionally the best* environmental quality. Taking into consideration the economic difficulties, faced by Lithuania, it seems that more rational policy would be to strive for the *best affordable* environmental quality.

2) Scheme is very restrictive in terms of emission quantity maneuver. The concept of severely punishing progressive tax rates for the violation of the established emission limits is embedded in it and no form of cost-effective reallocation of emission rights is allowed.

3) The performance of the system is extremely vulnerable to the exogenic changes: the rapid inflation and the erratic path of "economy in transit" have completely destroyed it's original intentions. Instead of having an incentive effect, pollution taxes in Lithuania perform a rather insignificant revenue raising role.

4) Although the inflation-eroded tax rates are not binding, the overall environmentall pollution in Lithuania remains within the normative limits. This leaves a certain space for a possible trade-off between the economic and environmental goals.

5) The additional cost-*deffectiveness* of the scheme is caused by the (a) "advance quarterly tax payment" requirement with no possibility to apply the "unused" portion of payment to the next quarters estimated

[10] Along with *annual* limits, the *short-term* emission restrictions are imposed upon polluters as well. Their violation is penalised in much the same way (that is, using the same formulas, violation time prorated) as the transgression of the annual emissions standard.

tax – this imposes a high opportunity costs upon less-than-allowed polluting sources; (b) lack of legal possibility of any form of emission reductions banking or trade between the regulation subjects, causing the situation where the various firms are incurring quite different marginal costs of pollution control. The "a" calls for an emissions standard's flexibility *in time,* the "b" – for the same in *space.*

6) Assuming that the present economical difficulties of Lithuania will come to an end some time in the future, it is still hard to expect that the effluent taxation scheme, described above, even at it's best, i.e. with an appropriate adjustment of a tax rates, will provide anything but an *expensive* environmental quality.

1.2. Socio-Economic Conditions of the Environmental Policy Reform

Being just a part of the whole socio-economic policy "package", the environmental policy or, even more so, it's reforms should not be examined in the political and economic "vacuum". The detailed analysis of Lithuania's economic and political situation is beyond the scope of this study, however a brief mention of it's features that most likely could be exogenous determinants of the environmental policy seems to be imperative.

Thus, assessment of the political and economic situation in Lithuania leads to the following conclusions in respect to the environmental policy reforms:

1) As the whole Lithuanian political and economic system is still undergoing transitional changes, the environmental management reform could be regarded as a part of the process. In those circumstances, such reform could be politically much more passable than, for instance, in the West European countries (It is always harder to break an old system, deeply rooted both in minds and institutions).

2) It is absolutely clear that lobbying industrialists are by far more politically influential group than environmentalists. Both "greens" and

their slogans were extremely popular in the first wave of rush for restoration of Independence, but afterwards the economic problems forced the environmental considerations downwards on the list of priorities. By now the "Green Party" virtually ceased to exist and a few ostensibly non-political groups of "greens" – the potential opponents of the "market oriented" environmental management reform – are both week and insufficiently organized to launch an effective lobbying against it. On the contrary, Lithuanian government is still quite susceptible to the "market based" ideas.

3) Taking into account the present economic difficulties and political pressures it is evident that in the trade-off between environmental goals and *economic efficiency* the latter is likely to be valued much higher than the former. That could be even more so due to the fact, that the decline of economic activity in scale resulted in corresponding significant reduction of the total volume of emissions both into air and water[11].

Thus, it could be stated that the time and socio-economic conditions for introduction of a cost-effective pollution control scheme in Lithuania seem to be quite auspicious.

2. THE ALTERNATIVES OF POLLUTION MANAGEMENT POLICY IMPROVEMENT

2.1. Goals of Reform and Criteria for Comparison of It's Alternatives

The two categories outlined above are closely intertwined; in fact, *goals* to a major extent determine the content of *criteria*. Thus, the former should be explicitly formulated before proceeding to the later.

The defficiencies of Lithuanian pollution control management scheme, revealed in Section 1, effectively predetermines the most promising direction of it's reforms: briefly stated, it is ***economization*** of

[11] According to the environmental statistics the total amount of stationary sources emissions into atmosphere in 1994 constitued just about 40% of 1989 level (*Lithuanian National Environmental Strategy...* (Vilnius, 1996).

the system. However, the meaning of the term as applied here is twofold, that is, it encompasses *both* the *upgrading of* management instruments towards provision of economic incentives for pollution control and the *economization* of the environmental policy *objectives* themselves.

Most of textbooks and compendiums on environmental economics devote a paragraph or two to the concept of economic optimum of pollution control. It is customary defined as such level of abatement activities where (the necessary condition) the marginal costs of control are equal to the marginal damage from pollution.

Usually, the definition and characterization of this fundamental concept as the desirable "first-best" solution of environmental problems (at least – from the economists point of view) is followed by an explanation, why – at least, for a time being – it is next to impossible to use it for operational purposes. The second-best approach is usually suggested instead, that is, a search for the least-cost attainment of a given environmental quality standards. The latter are customary expressed as a *vector* of either the ambient concentrations of various pollutants or the amounts of their emissions. Remarkably, the majority of market-oriented environmental policy mechanism studies are – implicitly or explicitly – based on this type of "second-best approach". It is notably an "environmentally biased" approach, especially as the standards are usually set at the "maximum allowable" or "best available" levels, and trade-offs between a various types of pollutants are not allowed.

However, it seems that the gap between the "first-best" and "second-best" approaches is too wide, and a median alternative, somewhat less environmentally restrictive, should be considered as well. Namely, the one that allows for the possibility of emissions trade-offs (by no means necessary on "one for one" basis) not only between the sources of pollution, but between the different pollutants as well. Note, that this possibility is implicitly incorporated in the "first-best" concept of pollution optimum by the linearity of monetary values: it is perfectly acceptable to increase discharge of one pollutant if the damage done is

outweighed by the decrease of other emissions. Pure systems of effluent charges are actually based on this sort of rationale.

Thus, the "in-between" the first- and second-best approaches could be defined as a least-cost attainment of the established standard of *total amount* of emissions into a specified type of environment. Compared to the outlined above second-best approach, this is a trade-off between the environmental and economic goals, definitely favoring the latter[12].

Another major goal of environmental policy reform, as already mentioned above, is creation of such an economic incentive-based mechanism for pollution control, that will enable to employ the market-driven creativity of polluters themselves in search for a least-cost solution to environmental problems. This limits a search for an improvement alternatives to the few directions.

Alternatives of the pollution control policy reform will be investigated bearing the two main questions in mind, that is:

a) whether the approach is likely to result in improvement over the existing policy, and b) what are it's advantages compared to the other alternatives. The following criteria will be employed[13]:

1. *Environmental effectiveness,* to be judged by two sub-criteria:
   a) will the policy achieve the stated environmental objectives?
   b) will it provide further incentives for environmental improvement?

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[12] Although it may give such an impression, this exchange does not automatically contradict the notion of a "sustainable development". If we accept the so called "production function approach" to the definition of sustainability (see Maller, et al. (1994), p. 233–249) this trade-off could be regarded in terms of a substitution between the "production capital " and "natural capital".

[13] Note that quite an important criterion is left out of the list – the one of the *overall economic efficiency* of policy change. That is, what type and scope of impact the proposed policy is likely to have on the economy as a whole – in terms of effects on industrial sector, prices, employment, international competitiveness of production, public revenues, households, etc., (see, for instance, Hazilla and Kopp (1990), OECD (1993), US Congress (1985). The reason behind this omission is a simple one – there is no possibility to predict, let alone evaluate, these effects without using computable models of economy.

2. *Economic efficiency* – will the considered policy stimulate the least-cost achievement of environmental goals?

3. *Organizational feasibility:*

a) will the policy need new and sophisticated institutional framework?

b) will the organizational, monitoring and enforcement costs be reasonable?

4. *Social and political feasibility*, to be evaluated along the following lines:

a) does the considered reform alternative stipulates radical or smooth change of a current policy ?

b) will the policy reform is likely to encounter an opposition of an influential group, who can face an identifiable losses because of the reform ?

5. *Flexibility*: will the new policy be accommodative to changes in preferences, technology, economic and environmental situation?

2.2. Alternatives of Policy Improvement

2.2.1. Upgrading of pollution taxation scheme. This is rather natural alternative to consider, favorable on account of both organizational and, to a somewhat lesser extent, political feasibility. Upgrading could take place along the few main lines:

* *Raise the basic tax rates to the incentive-providing level* together with an introduction of an effective constant indexation scheme. First of all, it is "easy to say, hard to do" recipe, because to set tariffs at the efficient level ("not a penny more, not a penny less") the regulating agency needs to know the marginal pollution control cost curves of the regulated. This data can be extremely difficult and costly to obtain, especially if to take into account the state of statistics in the country that is undergoing transition. More so, as noted elsewhere (see OECD (1977), p. 60–61, U.S. Congress (1985), p. 89–90]), such data could be not enough for the prediction of polluters response to tax increase: if the influence of bigger

polluters over the market is great enough to allow them to pass the tax to consumer, or if price elasticity of demand for the goods associated with emissions is low, some of the polluters may choose to pay the tax penalty rather than control their discharges – even if the marginal cost of control was lower than the tax rate. Thus, the problem of calculation of an environmentally efficient tax level becomes even more complicated[14].

Theoretically, it is, of course, possible to find the efficient tax level via the gradual increase of tax rates until the sought upon response is obtained, that is via the "trial-and error" method. However, regardless of other well-known complications, this approach is completely inapplicable in the recessed and "spluttering" economy.

From the point of economic efficiency it is clear that it does not eliminate the crucial obstacle for the achievement of cost-effective allocation of control efforts, namely – the sharp "break-jump" character of the "pollution supply" curve (see Appendix). Under these circumstances the incentive-level tariffs would simply convert the system to the charge-decorated rigid "command-and-control" type of regulatory mechanism.

This alternative, nevertheless, has a couple of advantages: it doesn't require any radical changes of the existing system, neither it would likely evoke an increase in the organizational or enforcement costs. However, it's social-political feasibility is doubtable: on one hand, due to the reasons outlined above, the burden of environmental taxes might be partly transferred upon consumers, on the other – tax increase would not be looked upon favorably by the most, perhaps, influential lobby group, i.e. industrialists[15].

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[14] However, the rapid price dynamics in Lithuania during the last 3–4 years creates a greater oppportunity (assumed that the necessary data is available) for the *ex ante* analysis and rough estimation of price elasticities for pollution related goods.

[15] To a certain degree this opposition can be mitigated by a compensatory decrease in other, direct or indirect, fiscal tariffs, or by some scheme of return of collected taxes to the taxed. However, the scope of an offseting decrease or a design of redistributory system again raise many non-trivial and politically touchy questions, the distributional incidence not the least among them.

As for the flexibility – the new system would still require constant and rather complicated adjustments to the changing economic and technological environment. The first step, of course, would be to change the current system of advanced and "non-transferable" quarterly tax payments into the one that accommodates the "stop-go" type of fluctuations in source operation.

* *Change the taxation scheme* (could be combined with the tariffs raise). One of the ways to do that is to get rid of a sharply progressive and all-emission-volume applied penalty rate, and to introduce a double flat-rate system: one for emissions up to a standard, another – for an excess discharges. This would certainly reduce the prohibitive impact of penalty structure under the present system, thus introducing more options for polluters, together with an overall saving potential. Mind that this increase in flexibility would be achieved only in exchange to a certain degree jeopardizing of the environmental quality targets.

However, this approach still allows for a variance in marginal abatement costs – even at the same emissions level.

In respect to other criteria, this reform alternative is close to the one discussed above. It still leaves open the question about the behavior inducing level of a tax rate, as well as doubts about the political feasibility of reform and the flexibility of a new system in face of other changes.

* *Change the taxation purpose,* i.e. instead of aiming towards incentive level of tax rate, switch to the revenue-raising taxation.

The comparative advantage of this approach is that it does not require the painful and troublesome approximation of the incentive-providing level of tax. However, other important questions are still in force: what are the optimal tax rates? what will be the macroeconomic and distributional incidences of tax payments? how the revenue from pollution taxes should be used? how to avoid social, economic and environmental distortions, that may be caused by the revenue collection and distribution?

If the flat-tax rate was introduced in place of current system, this approach would result in a cost-effective allocation of abatement ef-

forts (equation of marginal pollution control costs among sources) but – at the expense of environmental effectiveness loss: the emission standards would not be binding anymore. The political feasibility of a new system would be subject to the tax rate level, but, generally speaking, the favorable attitude would be likely. And the system's flexibility problems would become much of the same nature as of any other revenue-raising tax.

The preservation of the current penalty/preference system would simply mean return to the initial policy, only with different purpose and levels of taxation.

Thus, summing up, the pollution taxation upgrading alternatives are not likely to lead towards greater economic effectiveness or flexibility of the system, although their relative advantage is the easy fit-in into current pattern.

*2.2.2. **Conversion to the marketable pollution permits system.*** Perhaps, the easiest and most convenient way to do this is to allow sources, that have emissions "economy" under the current system, to sell it to those, that find it difficult to cope with standard requirements. This policy reform alternative, called Emissions Reduction Credits (ERCs) approach, is proposed and discussed in Harrington (1993). One of it's advantages is the relative implementation simplicity: "A marketable emissions credit program could be grafted onto the current environmental policy simply by making the normative limits tradable. To control the resulting aggregate pollutant load, the environmental authorities would simply control the sum of the normative limits [of particular pollutant – L.C.]. The basic effluent fee in this system would not matter very much; the fee, whatever it is, would be reflected in the market value of the permits. The penalty rate would be retained in this scheme and applied to the difference between the actual emissions and the permits owned"[16].

[16] Harrington, W. Air and Water Quality Permitting in Lithuania. Working paper, Harvard Institute for International Development, Cambridge(Mass.), 1993, p.19.

In addition to that, the proposed change seems to be quite feasible from the political angle – it's potential benefits are transparent and attractive, and there is no immediately identifiable losers.

Another privilege of ERCs is their capability to induce a cost-effective allocation of pollution control efforts.

On the other hand, the environmental efficiency features of the instrument would be different: it would become *overall emissions quantity* oriented, while relaxing requirements towards particular pollution subjects. As Harrington (1993) notes, this may give a rise to the spatial and intertemporal problems with emissions trade: it will not be reasonable any longer to expect the meeting of ambient quality targets.

However, it seems that the crucial role in determination of the feasibility of the ERCs system is played by the organizational aspects of it's implementation. As we see it, problem here is not in the development of market institutions for an ERCs transfers. Such concern was expressed by Harrington (1993), but since then Lithuanian economy has witnessed the birth of stock exchange and slow growth of it's operations, including the trades in short-term governmental bills. ERC policy can be jeopardized by the small and segmented market for pollution permits. Recall that there is *one hundred* different types of air pollutants alone, that have tax rates posted for them. If the comprehensive ERCs system, encompassing all of them, was introduced, that would mean 100 diffe-rent markets for each substance. Of course, each of polluters would have to participate only in the subset of these markets, but it still would undoubtedly impose a heavy burden of transaction costs upon them, on one hand, and impair the scope of activity in the permits market, on the other. The latter would also be threatened by the fact that just about 400 from over 113,436 registered firms in Lithuania could be considered as a "serious" polluters, likely to be interested in permits trading[17]. This means that the markets would be probably pretty thin. That,

[17] This number is an expert estimation, provided by the analysts of Ministry of Economics and Departament of Statistics. Surprisingly, no exact data on the question appears to be available, probably it isn't collected at all.

combined with novelty of trading in permits, can seriously hamper the chances of achievement of equilibrium prices for permits.

Another phenomenon, that can influence the efficiency of the discussed policy alternative, is a source-specific complementarity of pollutants in discharges. Quite often it is technically impossible or too complicated to lower (or increase) emissions of just one pollutant, while keeping discharge of others at the same level. This would impose necessity upon polluters to trade in several permit markets simultaneously and in certain proportions. It is likely to make the system quite cumbersome and to contribute further to the burden of transaction costs.

An obvious way to evade the uncomfortable market thinness is to limit the ERCs program to just a few, possibly even one pollutant. However, in that case most of the potential benefits, traditionally attributed to the marketable permits approach, would be lost. In addition, the question of how to improve the control policy of the *rest* (majority) of pollutants will still be open.

2.2.3. Introduction of transferable universal emission coupons. The unique feature of this concept, compared to "traditional" marketable pollution permits schemes, is the universality of pollution permitting coupons and their extended transferability in time and space. Universality of permits would be achieved by an introduction of a specific kind of "pollution currency" that should be used for "payments" for the right to emit different types of pollutants, carrying different "prices". Once submitted to the controlling body, coupons would be withdrawn from circulation with possible later their return to the market. The total amount of issued coupons, as well as quota of their return to the market, would depend on the attainment of established environmental quality targets. Like any other, also "pollution currency" would be not restricted by locality and unlimited in time, thus widening the market and making possible either to acquire the necessary amount of emission credits *post factum* or to bank the surplus coupons for the use later on.

This scheme of universal and transferable emission coupons (UTECs) is partly based on the real life Lithuanian experience in 1991–1992 with the so called "gen-

eral coupons". They were then used for rationing of scarce and underpriced (mind that prices then were still regulated by state) consumer goods. Buyer was supposed to pay the price of a high-demand commodity **both** in usual currency – then Soviet roubles (SUR) – and in "general coupons" (talonas). Coupons were distributed as a 20% premium on the salaries, pensions and on the payments for the agriculture production sold to the state. A limited reserve of "general coupons" was designed to be sold at the State Bank on a "first come – first serve" basis. Initial price was established at 2 SUR per coupon, but, subject to demand and adjusted weekly, it constantly decreased, and at the turn of a year the coupon's "street" price was just about 0.5 SUR per coupon (officially 1 SUR/coupon). Gradually, as more and more prices were released from the state control, "general coupons" outlived their usefulness and were abolished in May, 1992.

The main advantages of this approach are related to the expected increase of economic effectiveness of pollution control policy. Unlike traditional MPPs schemes, universality of UTECs eliminates the cumbersome multi-market structure of permits trade and allows the "one-stop shopping" for the set of pollution rights. More so, it also eliminates the awkward necessity for polluter to perform a trade-off between discharges of pollutants X and Z via the permits market(s), that is – selling the permits to emit one substance and buying discharge rights for another. Under the UTECs scheme it can be done simply by allocation more of the universal coupons to one kind of emissions and less to another.

All this clearly indicates a substantial transaction costs reduction potential[18]. Non-restricted spatial and intertemporal transferability of permits would contribute to that as well.

On the other hand, UTECs concept clearly presumes further, compared to the traditional MPPs, relaxation of environmental quality targets. If under, for example, ERCs scheme the target is to keep "under the lid" the total amount of *every single pollutant's* discharges, UTECs alternative requires only not to exceed the total limit of *all emissions*. Of course, such approach, especially if combined with spatial flexibility of trades, can cause an environmentally troublesome allocation of pollution rights. Possible

[18] As it is shown elsewhere (see Stavins (1993) transaction costs can have a distortive impact on a cost-effective allocation of pollution control efforts.

means of mitigation of these threats will be examined in the Section 3, along with the detailed discussion and design of UTECs model.

(To be continued in the next volume of "Ekonomika")

Appendix: *Pollution taxation in Lithuania*

1. Tax rate calculation formulas:

a) $T_i^1 = T_0 \cdot \left(1 + \frac{F}{N}\right)$,

b) $T_i^2 = T_0 \cdot \left(1 + 4\frac{F}{N}\right)$,

c) $T_r = T_0 \cdot \left(1 - 2\frac{N-F}{N}\right)$.

where:

F – *actual ammount of emissions (in tonns),*

N – *emissions standard;*

T_i^1 – *increased tax rate for power plants,*

T_i^2 – *increased tax rate for industrial enterprises,*

T_r – *reduced (preferential) tax rate.*

2. Penalty for excess emissions calculation formula:

$$P = T_i^{1(2)} \cdot F - T_0 \cdot F,$$

where:

P – penalty amount,

F– actual amount of emissions.

Refferences

1. Harrington, W. Air and Water Quality Permitting in Lithuania. Working paper, Harvard Institute for International Development, Cambridge(Mass.), 1993.

2. Hazilla, M. and Kopp, R. J. Social Cost of Environmental Regulations: A General Equilibrium Analysis // *Journal of Political Economy* 4(1990): 853–874.

3. Lithuanian National Environmental Strategy, Vol. A: Background to the Strattegy. Environmental Protection Ministry of Lithuania, Vilnius, 1996.

4. The Lithuanian Republic Law on Taxes on the State Natural Resources // *The Environmental Protection in the Republic of Lithuania*, Information Bulletin No 1. Vilnius: Lithuanian Information Institute, 1992, p. 20–22.

5. Lithuanian Republic Law on Taxes on Environmental Pollution // *The Environmental Protection in the Republic of Lithuania*, Information Bulletin No 1. Vilnius: Lithuanian Information Institute, 1992, p. 24–29.

6. Maler, K. G., Gren, I. M., and Folke, C. Multiple Use of Environmental Resources: A Household Production Function Approach to Valuing Natural Capital // *Investing in Natural Capital: The Ecological Economics Approach to Sustainability*, eds. Jannson, A. M. et al. Washington, D. C.: Island Press, 1994, p. 233–249.

7. OECD. *Environmental Policies in Japan*. OECD, Paris, 1977.

8. OECD. *Taxation and Environment: Coplimentary Policies*. OECD, Paris, 1993.

9. Stavins, R. N. Transaction Costs and the Performance of Markets for Pollution Control. Discussion Paper, John F. Kennedy School of Government, Cambridge (Mass.), 1993.

10. Stavins, R. N., ed. *Project 88/Round II. Incentives for Action: Designing Market-Based Environmental Strategies.* A Public Policy Study sponsored by Senator Timothy E. Wirth, Colorado, and Senator John Heinz, Pennsylvania. Washington, D. C., 1991.

11. U.S. Congress. Environmental Regulation and Economic Efficiency. Congressional Budget Office, Washington, D. C., 1985.

Pasiūlymas Lietuvos taršos valdymo sistemos reformai: „taršos valiutos" koncepcija (I dalis)

Santrauka

Straipsnyje pristatomas ir pagrindžiamas konceptualus ekonomiškai efektyvios aplinkos taršos valdymo sistemos modelis, besiremiantis originalia „taršos valiutos", naudotinos mokėjimams už teisę teršti orą ar vandenį, įvedimo idėja. Lietuvos pavyzdžiu svarstomos modelio praktinio taikymo galimybės.

Straipsnio pradžioje pateikiama glausta kritinė dabar Lietuvoje veikiančios gamtonaudos valdymo sistemos apžvalga, atskleidžiami šios sistemos trūkumai ir gvildenamos jų priežastys. Apibūdinamos politinės ir ekonominės jos reformos prielaidos ir sąlygos, konstatuojama palanki terpė orientuotam į ekonomiškai efektyvų taršos problemos sprendimą valdymo modeliui įdiegti.

Antroje straipsnio dalyje konkretinami reformos tikslai ir alternatyvių reformos variantų priimtinumo vertinimo kriterijai. Suformuluojamas modifikuotas antrinis (second-best) ekonomiškai optimalaus taršos problemos sprendimo kriterijus: nustatytas *bendros* išmetamų į aplinką *visų rūšių teršalų apimties* pasiekimas mažiausiomis išladomis. Aptariami alternatyvūs taršos valdymo sistemos reformos

būdai, santykiniai jų privalumai ir trūkumai. Pristatoma originali „bendrųjų taršos kuponų" – savotiškos „taršos valiutos" koncepcija.

„Taršos valiuta" savo esminiais aplinkosaugos valdymo instrumento bruožais yra artima kai kuriose Vakarų šalyse (pvz., JAV) naudojamiems perparduodamiems taršos leidimams *(marketable pollution permits)*. Tačiau, skirtingai nuo pastarųjų, „bendrieji taršos kuponai" yra universalūs, t. y. tinka *visų rūšių* teršalų išmetimams pateisinti, be to, jų galiojimas nėra ribotinas nei laiko, nei erdvės atžvilgiu.

Straipsnio tęsinys, skirtas išsamiai „taršos valiutos" modelio bruožų, potencialių jo taikymo problemų ir galimų jų sprendimo būdų analizei, kitame mokslo darbų „Ekonomika" numeryje.

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