The theory-based policy evaluation method applied to the ex-post evaluation of climate change policies in the built environment in the Netherlands

Mirjam Harmelink
Ecofys
Kanaalweg 16-G
P.O. Box 8408
NL-3503 RK Utrecht
The Netherlands
m.harmelink@ecofys.nl

Suzanne Joosen
Ecofys

Kornelis Blok
Ecofys

Keywords

ex-post evaluation, energy efficiency, climate, policies, built environment, theory-based evaluation, program theory, program logic model

Abstract

The challenge within ex-post policy evaluation research is to unravel the whole policy process and evaluate the effect and effectiveness of the different steps. Through this unravelling of the policy implementation process, insight is gained on where something went wrong in the process of policy design and implementation and where the keys are for improving the effectiveness and efficiency.

This article presents the results of an ex-post policy evaluation of the effect and effectiveness of the Energy Premium Regulation scheme and the Long Term Voluntary agreements to reduce CO_2 emissions in the built environment in the Netherlands applying the theory-based policy evaluation method. The article starts with a description of the theory-based policy evaluation method. The method begins with the formulation of a program theory, which describes the 'ideal' operation of a policy instrument, from the viewpoint of the policy makers. Thereupon the theory is checked and adapted through interviews with policy makers and executors, and the cause and effect chain is finally translated to (quantitative) indicators. The article shows that the theory-based evaluation method has benefits over other ex-post evaluation methods that include:

- The whole policy implementation process is evaluated and the focus is not just on the 'end-result' (i.e. efficiency improvement and CO_2 emission reduction).
- Through the development of indicators for each step in the implementation process, "successes and failures" are quantified to the greatest possible extent.
- By applying this approach we not only learn whether policies are successful or not, but also why they succeeded or failed and how they can be improved.

Introduction

This paper provides an overview of the theory-based policy evaluation method: an ex-post evaluation method that provides insight in the 'success and failure' of individual policy instruments. We first discuss the role of ex-post policy evaluation in the policy evaluation cycle, and provide an overview of the status of ex-post methods in the evaluation of energy and climate change policies. Next we discuss in more detail the theory-based policy evaluation methods and provide a practical step-by-step approach. This step-by-step approach is illustrated by discussing the results of the ex-post evaluation of two instruments that were implemented in the Netherlands to improve energy-efficiency and achieve CO_2 reductions in the built environment (Joosen et al, 2004). We finalise with conclusions and discussion on the pros and cons of the theory-based policy evaluation method.

Ex-post policy evaluation

Ex-post policy evaluation is an essential element in the policy cycle (see Figure 1). In a perfect policy cycle first policies are formulated, in the next step policies are implemented and ultimately policies are evaluated to show their effect(s). After policies have been implemented they should be mon-

itored and evaluated, and results of the monitoring and evaluation process might lead to a reformulation or even an abolishment of policies.

Ex-post policy evaluation of energy and climate change policies is getting more common: however the number of executed studies is still limited. Much research is targeted towards the implementation of specific instruments (e.g. projects on Cold and Wet Appliances, Efficient Domestic Ovens, Circulation Pumps) but substantially less research is aimed at systematically evaluating the key factors behind the success and failure of energy efficiency and climate policies (ex-post evaluation). Knowledge is growing in this area. Within the SAVE programme, the project entitled "A European Ex-post evaluation guidebook for DSM and EE Service Programmes" (SRC, 2001) developed general guidelines for ex-post evaluation of DSM and EE Services. The developed guidelines were tested for a number of DSM and EE Service programmes in the European Union. The IEA DSM IA (Task 1) is also expected to publish an "Evaluation Guidebook on the Impacts of DSM and EE Programmes on Kyoto's GHG Targets". Furthermore specific countries have showed initiatives in this field. For example, all policies in the Netherlands now require an ex-post evaluation and the Ministry of Finance has established generic guidelines for ex-post policy evaluation (MinFin, 2002).

Ex-post policy evaluation in principle boils down to answering the following two questions:

- What was the contribution of policy instruments in the realisation of policy targets (effectiveness of policy instruments)?
- What was the cost effectiveness of policy instruments, and could targets have been reached with lower costs (efficiency of policy instruments)?

These questions can be answered at two levels (i) at the programme level (in case the effect and effectiveness of a package of policy instruments aimed at reaching a specific target is evaluated) and (ii) at the instrument level (in case the effect and effectiveness of one specific policy instruments is evaluated).

Most methods used in ex-post policy evaluation of policy instruments focus on 'final effects' i.e. energy savings and CO_2 reductions. This article provides a description of the theory-based policy evaluation method, which compared to other ex-post evaluation methods:

- Evaluates the whole policy implementation process and not just focuses on the final effects (i.e. efficiency improvement and CO_2 reduction).
- Quantifies, to the extent possible, the "successes and failures" of policy instruments through the development of indicators for each step in the implementation process.
- Provides insight on why policies succeeded or failed and how they can be improved.

Figure 1 shows the placement of the theory-based policy evaluation method in the policy cycle. In the step of policy formulation and policy implementation, policy makers should formulate a policy theory on how they think the introduced policy instrument will shows its effect. Afterwards, policies should be monitored and evaluated to check if the policy theory was correct or needs to be adapted, and if necessary should be followed by a reorganisation or restructuring of policies.

Theory-based policy evaluation

BACKGROUND

The theory-based approach is not new and has been used numerous times to evaluate policies. The method of theory-based policy evaluation is extensively described and illustrated (Rossi et al, 2004). The examples however are all outside the energy sector. In the energy sector the method was used to design, evaluate and adapt 'market transformation' programs in the field of energy efficiency in California (Blumstein et al, 2000). Though overall, the application in evaluating energy efficiency policies has been limited and was the method was so far not applied in a systematic way in the policy implementation process.

In practice, theory-based policy evaluation boils down to establishing a plausible theory on how a policy instrument (or a package of instruments) is expected to lead to energy efficiency improvements. Application of the theory-based approach in ex-post policy evaluation means that the whole policy implementation process is unravelled to evaluate the effectiveness and efficiency of the different steps of the implementation process. Through this unravelling insight is gained on 'where something went wrong in the process of policy design and implementation' and 'where the keys are for improving the effectiveness and efficiency'.

PRACTICAL FRAMEWORK TO EVALUATE INDIVIDUAL POLICY INSTRUMENTS

For the assessment of policy instrument the "theory-based policy evaluation" includes the following steps:

1. In the first step, the policy instrument is characterised. This is a description of the policy instrument including: targets, the period the policy instrument was active, target groups, policy implementing agents, available budget, available information on initial expected effectiveness and effectiveness of the instrument, etc.
2. In the second step, a policy or program theory is drawn-up. A policy or program theory includes all the assumptions on the way policy instruments should reach their targeted effect. Sometimes the policy theory is clearly described in official documents and well known by the policy makers. In these cases we speak of an "explicit policy or program theory". In most cases the policy theory for a specific instrument is not clearly described and in these cases the program theory is drawn up based on experiences with similar instruments and we speak of an "implicit policy or program theory". Drawing up a policy theory in practice includes documenting all implicit and explicit assumptions in the policy implementation process, and mapping the cause-impact relationship including the relationship with other policy instruments.
3. In the third step, the program theory is translated to concrete (quantifiable) indicators. This means that for each assumed cause-impact relation an indicator is drawn up

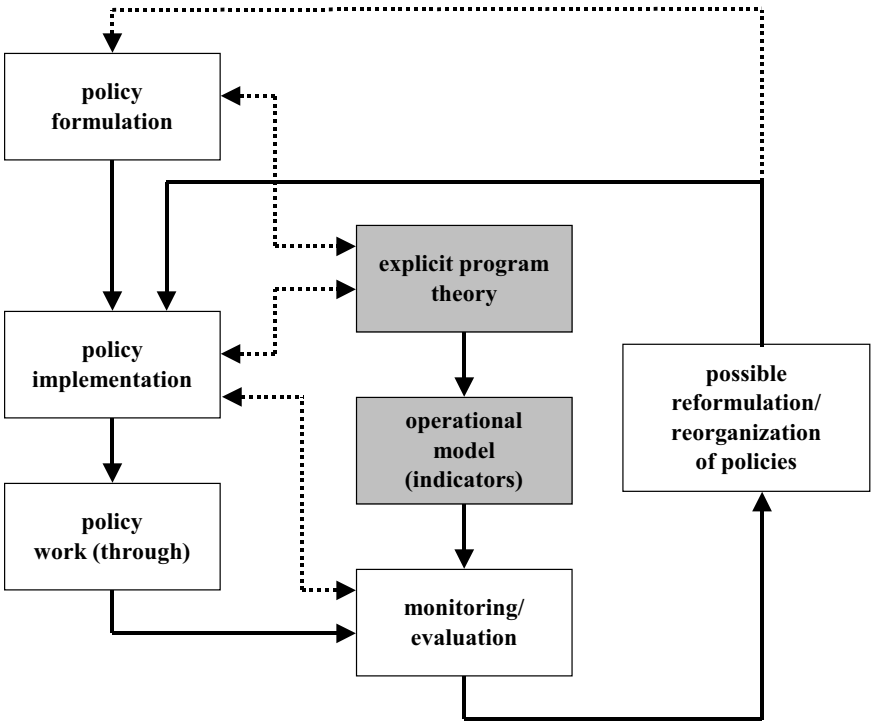

Figure 1. *Outline of the policy cycle and the role of the program theory in the policy cycle.*

to "measure" if the cause-impact relation actually took place and to "measure" if the change (or part of the change) that took place is due to the implementation of the policy instrument (i.e. the policy instrument was the causal force). This step also includes the development of the necessary formulas to calculate the effectiveness and efficiency.

4. In the fourth step, the cause-impact relations and the indicators are visually reflected in a flowchart. An example of such a flowchart is given in Figure 2 for the subsidy scheme in the Netherlands the Energy Premium Regulation (EPR).
5. In the fifth step, the policy theory is verified and if necessary adjusted. In step 2, the policy theory is drawn up with the help of available (official) documents or on experiences with similar instruments. In the fifth step the policy theory is verified through interviews with policy makers and implementing agents and other actors involved in the implementation and monitoring of the policy instrument.
6. In the sixth and final step:

   • Available information is gathered and analysed to draw up the indicators;

   • Conclusions are drawn on the effectiveness and efficiency of the policy instrument using; the formulas and indicators;

   • Analyses are made on the success and failure factors attributed to the analysed instruments; and

   • Recommendations are formulated to improve the effectiveness and efficiency.

Example 1: Energy Premium Regulation (EPR)

CHARACTERISATION OF THE INSTRUMENT

On January 1, 2000 the Energy Premium Regulation (EPR) was introduced in the Netherlands and was abolished again in October 2004. The EPR was introduced with the aim to stimulate households to invest in energy efficiency measures. Within the framework of the EPR, households received a fixed grant for a limited number of clearly defined energy saving measures. These measures included, among others, insulation, double-glazing, high efficiency boilers, A and A+ appliances, photovoltaic panels and solar thermal boilers. Besides the grants for investments in concrete measures, the cost of energy audits (Energy Performance Advice (EPA)) for households was also refunded.

In the first three years the EPR consisted of fiscal measures falling under the responsibility of the Ministry of Finance. As there was no budgetary limit for fiscal measures, the EPR was transferred in 2003 into a subsidy scheme with a cap on the total budget falling under the responsibility of the Ministry of Environment.

Energy distribution companies executed the EPR-scheme. This meant that households had to apply for a grant with the energy distribution companies that they handled the whole application and payment process. Energy distribution companies were chosen because they already had the infrastructure in place to handle a large amount of applica-

tions. This infrastructure was built up during the nineties when they executed the Environmental Action Plan (MAP).

The government had several aims with the introduction of the EPR. First the government wanted to reach energy savings and CO_2-reductions. Beforehand, the government announced that the introduction of the EPR and Energy Performance Advice (EPA) together had to lead to a CO_2 reduction in 2010 by 2.3 Mton (MinVrom, 1999). The EPR was furthermore introduced to recycle proceeds from the energy tax (REB) back in the household sector. Therefore the government intentionally included a number of 'approachable' measures on the list of items eligible for a grant. 'Approachable' measures are measures that had already reached a reasonable market share and were almost the standard in the market. These were included with the aim to stimulate a large group of households (including lower income households) to invest in energy efficiency measures and profit from the recycling of the energy tax proceeds.

PROGRAM THEORY AND TRANSLATION TO INDICATORS

The policy theory, including all the assumptions on how policy makers and executors thought that the EPR should reach the targeted effect, is included in Figure 2. It was assumed by policy makers that the EPR would lead to the implementation of energy efficiency measures and CO_2 reduction in the following ways:

1. Central government provides funding for the introduction of an EPR and draws up a list of measures eligible for funding.
2. Energy companies execute the EPR and start with generating publicity for households to be aware of the regulations.
3. Suppliers (producers, importers and retailers) of efficient appliances, installations and other products count on a higher demand for energy efficiency products and adapt their supply towards a larger supply of products eligible for a grant within the EPR.
4. Consumers consider purchasing new appliances or to invest in energy saving measures.
5. In the consumers' decision process of purchasing new appliances or to invest in energy saving measures, the EPR plays a role in three different ways:

   In case of a strict financial cost-benefit analysis because of the EPR, the decision process might take a turn in favour of a more energy efficient investment.

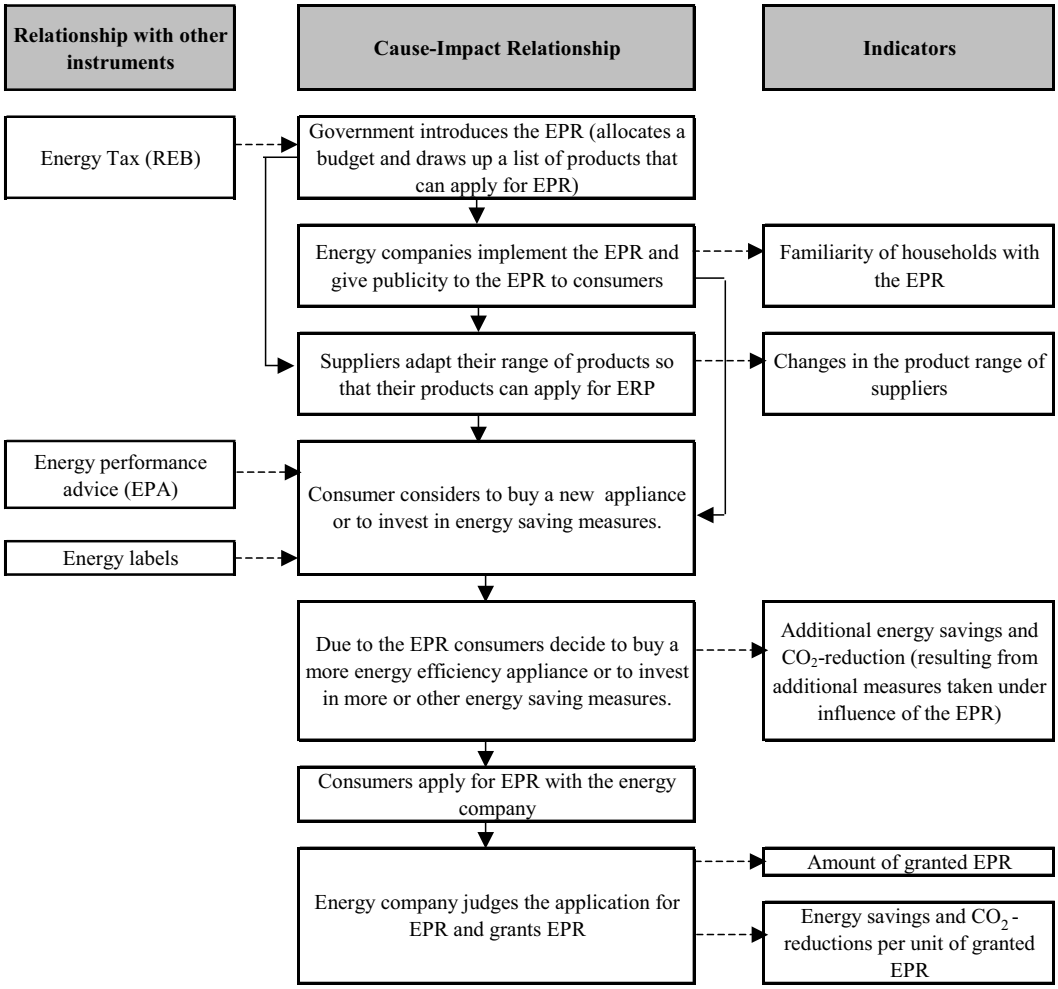

Figure 2. *Policy theory on the way the Energy Premium Regulation (EPR) should lead to energy savings and CO_2 reduction, including the link with other policy instruments and a list of indicators to 'measure' if assumed cause-impact relations actually occurred.*

In case of a less formal decision process, the EPR can limit additional investments for energy efficiency and persuade the consumer to purchase the energy efficient alternative.

The financial grant from the EPR might attract the attention of, and increase awareness with, the consumer concerning energy efficiency measures.

6. The consumer buys the energy efficient appliances of measure and puts these into use. The consumer applies for a grant from the EPR and receives money from the energy distribution company.

The EPR is linked with several other policy instruments. For measures bound to buildings (like insulation, double-glazing etc.) the EPR is strongly linked to the energy performance advice (EPA). For measures that were advised within the framework of an EPA and which are implemented, the consumer received a 25% bonus on top of the normal EPR grant for the measure. Furthermore there is a link with the energy tax (REB) that caused in an increase of the energy prices by 7% per year. In Figure 2 the policy theory is summarised in the form of cause-impact relationships (middle column). Furthermore the relationship with other policy instruments is included (left column) and in the right-hand column the indicators are presented, i.e. these are the factors which 'measure' whether the assumptions on the change expected from policy instruments led to changes that actually occurred.

EVALUATION OF THE CAUSE-IMPACT RELATIONSHIPS

In this section, we evaluate whether the cause-impact relationships assumed by policy makers for the EPR actually occurred by analysing the indicators.

Familiarity of the EPR with households

Familiarity of the EPR was investigated through different channels. Surveys from 2000 showed that 49% of those interviewed heard of the EPR. More than 33% heard of the EPR through newspapers and magazines, where as 28% were informed about the EPR at the time they were purchasing a product (EIM, 2001). A survey performed in 2002 found that 75% of homeowners were familiar with the EPR (RVD, 2003). This is obviously not a fully random sample of all households, at the same time homeowners are more likely to purchase more products than non-homeowners.

Changes in the product mix of suppliers

The assumption was that suppliers of products would change their range of product towards energy efficiency products eligible for a grant within the EPR. No detailed research was conducted on the effect of the EPR on changes in the product mix. There is however data available on the share of A label and A+ label appliances in the total sale of appliances in the Netherlands (see Table 1). The table shows that since the introduction of the EPR in 2002, the share of A-label appliances has significantly increased. This development however already started before the introduction of the EPR and was also influenced by subsidies, running from 1991 to 2000, granted under the Environmental Action Plan (MAP) of energy companies. Table 1 shows that as of 2001, A-label dishwashers, washing machines and refrigerators have become the standard in the market. This was also the reason that they were struck from the list of measures eligible for a grant within the EPR as of January 2003.

Additional energy savings and CO_2 reductions

The assumption was that due to the introduction of the EPR, consumers would make other choices with respect to investments in appliances and energy saving measures than what they would have made in the absence of the EPR. As with all subsidy schemes, the EPR had free riders that affected the effectiveness of the EPR (amount of energy savings that can be attributed to the EPR). A free rider was defined as a consumer who in the absence of financial support would have invested in the same energy saving measure at the same point in time. The share of free riders differed per type of measures and changed over time. Within the framework of the EPR the share of free riders was not systematically monitored. Only fragmented information for specific types of measures is available.

For the most common A-label appliances, the share of free riders was relatively high. A survey in 2001 showed that 84% of the consumers buying an A-label appliance would have bought the same appliance in case no grant from the EPR would have been available (Survey, 2002). This result corresponds with other surveys in which consumers stated that at the moment they bought the appliance, their attention was called to the EPR by the retailer (EnergieNed, 2001). For example high-efficiency boilers already had a market share of 77% at the time the EPR was introduced (ECN, 2003c). This high market share was reached in the period when the Environmental Action Plan of the energy distribution companies was executed, probably resulting in a high share of free riders for high efficiency boilers under the EPR (however no exact numbers are available because of a lack of monitoring data).

Table 1. Share of A label and A+ label in the total sale for appliances in the Netherlands for different appliances. Sources: (Vlehan, 2002 and 2003), (Tax Service, 2002).

% in total sales		1996	1997	1998	1999	2000	2001	2002
Dishwasher	A-label	-	-	-	27%	55%	74%	88%
Washing machine	A label	0%	3%	19%	39%	71%	89%	99%
Refrigerator	A label	7%	10%	14%	26%	54%	67%	-
Refrigerator	A+ label	-	-	-	-	-	-	13%
Dryer	A-label	-	-	-	-	-	-	-

Along the whole line, the EPR resulted in a high share of free riders, which was due to the fact that a large number of measures eligible for EPR were already standard in the market at the time the EPR was introduced. These 'approachable' measures were however wilfully introduced with the aim to give a large group of consumers the chance to profit from the recycling of the energy tax. The amount of annual primary energy savings compared to the situation with no EPR being introduced was estimated at 3-4 PJ in 2002 and a CO_2 reduction of approximately 0.2 million tonnes (Joosen et al, 2004).

Volume of granted subsidies
In the period 2000-2002, the total volume of granted subsidies increased from 50 million Euro in 2000 to 250 million Euro in 2002. Over 70% of the subsidies were granted for energy efficient appliances and insulation measures. Appliances mainly included refrigerators and washing machines, whereas the bulk of the insulation measures include roof and attic insulation.

Efficiency of the EPR
In order to determine the efficiency of the EPR-scheme, government expenditures per unit of CO_2 reduction was determined. The government expenditures included payments to consumers for installed measures (in total 416 million Euro in the period 2000-2002) and the administration costs for energy distribution companies who handled the EPR-applications (in total estimated at 86 million Euro). Accounting for the large share of free riders, this resulted in a costs-effectiveness for the government of 300 Euro per tonne of reduced CO_2. There is however a large difference in cost effectiveness per energy saving measures: high efficiency boilers (~95 Euro per tonne of CO_2), appliances (~420 Euro per tonne of CO_2), insulation (~250 Euro per tonne of CO_2) and for renewable energy options (~1 100 Euro per tonne of CO_2).

CONCLUSIONS ON SUCCESS AND FAILURE FACTORS

The EPR was well know with the target group, which resulted in a large number of consumers applying for a grant and in this way profiting from the recycling of the energy tax (REB). This meant that the aim of the government to let a large number of consumers profit from the REB was more or less reached. Another success factor of the EPR was that it contributed to 'market transformation' of the appliance market. With 'market transformation' we mean that A and A+ label appliances have become standard in the market. This market transformation however already had started under the Environmental Action Plan (MAP) in the nineties for energy distribution companies.

The EPR had a relatively high share of free riders, which was caused by the fact that a large number of measures eligible for funding were already standard in the market at the time the EPR was introduced. Because of the two-fold target of the EPR, the effectiveness of the EPR was low. On the one hand, the aim of the EPR was efficiently stimulating investments in energy efficient measures and on the other hand, a number of 'approachable' measure were wilfully included with the aim to let a large number of consumers profit from the recycling of the energy tax. The two-fold aim resulted in a low efficiency (cost-effectiveness) of the EPR. The average cost for the government was 300 Euro per reduced tonne of CO_2. The efficiency was furthermore negatively influenced due to the high administrative cost for handling the applications. The energy companies had to handle a large number of applications, but with each application leading to a relatively small energy saving. The efficiency (in reaching energy savings) of the EPR could have been better (i.e. the cost-effectiveness of the government costs could have been lower) if the EPR was monitored and evaluated annually, and each year measures that already had reached a significant market share would have been taken from the list.

It must be noted that it is hard to exactly determine the effect of the EPR. On the one hand the observed market transformation are due to earlier effects (the Environmental Action Plan of the energy companies) and on the other hand effects will take place in future year, which is not taken into account in our analysis.

Example 2: Long-term Agreements (LTA) in the building sector

CHARACTERISATION OF THE INSTRUMENT

Within the framework of energy efficiency policy in the Netherlands, the long-term agreement (LTA) on energy efficiency was introduced in 1992. This resulted in several agreements with branch organisations and individual organisations in the commercial and non-profit building sector. The overall aim of the government was to reach an energy efficiency improvement in the building sector of 25% to 30% (on average) in 2000 compared to 1989 (Novem, div). The LTA's were actually a package deal. Companies joining an LTA received support from the energy agency Novem and could apply for financial support for investments in measures with several subsidy schemes and fiscal measures.

The starting point of the government was to negotiate agreement with each sector annually consuming more than 1 PJ. This resulted in long-term agreements with branch organisations and large organisations listed in Table 2).

PROGRAM THEORY AND TRANSLATION TO INDICATORS

The policy theory including all the assumptions on the way in which policy makers and executors thought that the long-term agreements should reach the targeted effect is included in Figure 3. It was assumed by policy makers that the LTA would lead to the implementation of energy efficiency measures and CO_2 reductions in the following way:

1. The government introduces the long-term voluntary agreement (LTA) on energy efficiency with the aim to reach an energy efficiency improvement of 25% to 30% in the commercial and non-profit building sectors. Simultaneously the government makes available funds for stimulating investments in energy saving measures as part of the LTAs and to support the LTA process.
2. Branch organisations draw up a report including an inventory of possible energy saving measures and the energy saving potential in their sector. The energy

agency Novem supports branch organisations with this inventory.

3. The branch organisations, with support from Novem, translate the results of the inventory into quantitative targets for the sectors.
4. The branch organisations together with Novem draw up a long range Energy Efficiency Plan (EEP), including concrete measures that can be implemented.
5. The government enters into a long-term agreement with branch organisations and individual firms.
6. Individual organisations and firms join the long-term agreements. They draw up an Energy Efficiency Plan for their individual organisations leading to an increased attention to energy efficiency and insights on possibilities for saving energy.
7. Individual organisations and firms implement the Energy Efficiency Plan and save energy.
8. The individual organisations and firms monitor their energy use annually and report their energy efficiency index (EEI) to the energy agency Novem.
9. Novem systematically checks the submitted monitoring information and reports on the energy savings achieved at the sector level.

The LTAs are linked with several other policy instruments providing financial support for concrete investments (these were actually part of the package deal). These include subsidy programmes like; grants from the Environmental Action Plan (MAP) of energy companies, subsidy scheme (EINP) and fiscal measures (EIA and VAMIL) established by the national government.

In Figure 3, the policy theory is summarised in the form of cause-impact relationships (middle column). Furthermore the relationship with other policy instruments is included (left column) and in the right-hand column the indicators are presented, i.e. these are the factors, which 'measure' if the assumptions on the way the policy instruments would lead to changes actually occurred.

EVALUATION OF THE CAUSE-IMPACT RELATIONSHIPS

Quality of the inventory
During the inventory possible energy efficiency measures were listed including 'good housekeeping', energy management, energy efficient heating, efficient lighting, insulation measures and efficient appliances. Starting point of the inventory was that companies joining the long-term agreement should implement all measures with a payback time of less than five years. No information is available on the overall quality of the inventories, but during the interviews we did not get the impression that potentials were either estimated to high or low.

Energy efficiency target compared the initial overall targets of the government
Table 2 provides an overview of the targets that were agreed upon within the different long-term agreements at the sector or company level. These targets were based on the inventories executed per sector or company. Because the selected sectors and firms had a very diverse structure the sectors and firm specific targets more or less deviate from the overall target of 25-30% for the period 1989-2000. For some sectors, such as universities and Dutch Railways, the target is far below the overall indicative figures.

Number of parties that join the LTA
An analysis of the energy use of companies that joined an LTA shows that together these companies represent 15% of the energy use in the building sector (Novem, div) (CBS, 2003). It is unknown which share of companies using more than 1 PJ annually joined an LTA.

Attention to and familiarity with energy savings
The assumption was that through the introduction of LTAs in the built environment attention would get drawn to energy savings and knowledge on energy saving measures would increase. The Energy Efficiency Plan (EEP) at the firm level had to play a vital role in the matter. An evaluation of the LTA process in 2001 concluded that the LTAs have led to more attention for energy saving measures at the company board level and with energy and environmental co-ordinators (Berenschot, 2001b).

The increased attention for energy saving measures did not, however, lead to a higher priority for investment in energy saving measures in sectors that stepped into an LTA. Novem for example observed in the annual monitoring reports that, as firms and organisations are confronted with budget cuts, restructuring operations and sometimes high costs for new building and large-scale renovations, they put energy efficiency measures less priority. This was also visible in the very difficult process that led to an agreement on the monitoring methodology. Furthermore some sectors were very late in submitting monitoring information or even submitted no information at all.

Type and number of implemented energy efficiency measures
No public information is available on the type of energy efficiency measures that have been implemented by organisations that joined an LTA.

Achieve energy savings
Table 2 provides an overview of the realised energy savings as they were monitored so far. It can be noted that the results are very diverse; one sector exceeded the target (Royal Dutch Airlines) whereas other sectors showed negative savings.

It is hard to get a good overview of the achieved energy savings. As already mentioned some sectors did not or were too late in delivering monitoring information. Furthermore monitoring information is often not complete or incorrect. For example sectors did not always correct their energy efficiency index (EEI) for structural changes that took place during the term of the LTA. These included not correcting for longer opening hours of schools, changes in occupancy rate of a hospital or the increased used of information technology. This may be the cause for some sectors showing negative energy savings.

The reported energy savings cannot all be attributed to the implementation of the LTA. Part of the energy efficiency improvement would also have happened in the absence

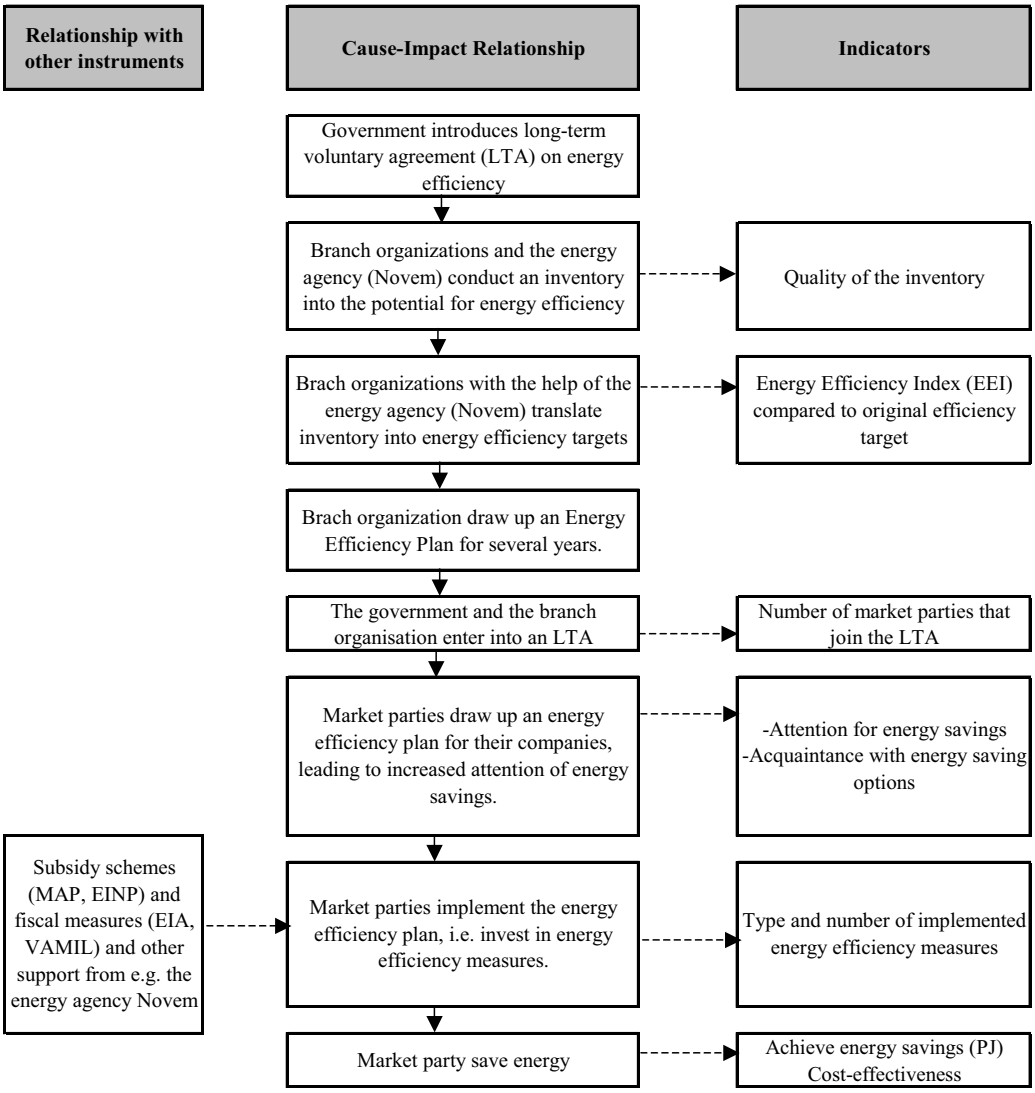

Figure 3. *Policy theory on they way the long-term agreements (LTA) in the building sector should lead to energy savings and CO_2 reduction, including the link with other policy instruments and a list of indicators to 'measure' in assumed cause-impact relations actually occurred.*

of LTAs, the so-called autonomous efficiency improvement. This autonomous efficiency improvement in the building sectors was not systematically investigated. From research in the industry sector it is know that 18% to 53% of the savings reported under LTAs can be attributed to the introduction of the LTA. In other words 47% to 82% of the reported savings would also have been reached in the absence of LTAs (UU, 2002). Assuming that these numbers can be applied to the building sector as well primary energy savings in the period 1995-2002 achieved by the LTAs is 0.5 to 1.5 PJ (~0.1 million ton of CO_2). It must however be noted that transferring of results from the industry to the building sectors must be done with much care because of the different structures of the sector.

Efficiency of LTA

In order to determine the efficiency of the LTAs government expenditures per unit of CO_2 reduction was determined. The government expenditures included (1) capacity from Novem to support the LTA process, (2) Funding to support the executing of the LTAs (e.g. to fund feasibility studies) and (3) grants and fiscal support. Total government expenditures were estimated at 53 tot 76 million Euro over the period 1995-2002, of which about 50% were for subsidies and fiscal measures (Berenschot, 2001b) (Senter, 2003). This resulted in a cost-effectiveness for the government of 60-190 Euro per reduced tonne of CO_2. The cost-effectiveness figure is two times higher then the average figure for fiscal measures and grants in the buildings sector (Joossen et al, 2004). This shows that the efficiency of the policy instrument LTA in the building sector is not very high.

CONCLUSIONS ON SUCCESS AND FAILURE FACTORS

The LTAs in the building sector in the Netherlands have led to an increased in attention for and knowledge on energy saving measures. The LTAs however have not led to a higher priority in investments in energy saving measures with sectors that stepped into an LTA. The low share of energy costs in overall costs, budget cuts for non-profit sectors, restructuring operations, high costs for new buildings and

Table 2. Overview of energy efficiency targets for the different sectors and firms included in the LTA, the energy saving that have been monitored so far and the saving that can be attributed to the LTA (Novem, div).

	LTA target	Reference year	End year	Monitored year	Realized energy saving in monitored year	Gross energy savings[1] 1995-2002	Energy savings that can be attributed to the LTA[1] 1995-2002	
	%				%	PJ_{prim}	PJ_{prim} (low)	PJ_{prim} (high)
Supermarkets	32%	1995	2010	2001	-3.5%	0.0	0.0	0.0
Banks	25%	1995	2006	2002	10.0%	0.5	0.1	0.3
Dutch Railways	11%	1997	2010	2002	8.5%	0.2	0.0	0.1
Insurance sector	23%	1996	2006	2002	3.4%	0.1	0.0	0.0
Schiphol Group	28%	1989	2000	1999	21.0%	0.3	0.1	0.2
Royal Dutch Airlines (KLM)	28%	1989	2000	1999	35.0%	0.6	0.1	0.3
Vocational training sector	30%	1994	No monitoring information available					
School of Higher Vocational Education	30%	1994	2006	2001	-1.0%	0.0	0.0	0.0
Foundation of Universities	14%	1996	2006	2002	-1.9%	0.0	0.0	0.0
Hospital health care	30%	1989	2001	1999	8.0%	1.3	0.2	0.7
Sport and recreation sector	25%	1998	2010	2002	0.0%	0.0	0.0	0.0
Total						2.9	0.53	1.55

[1] In case of "negative savings" it is assumed that the LTA did not lead to energy savings

large-scale renovations gave energy efficiency measures a lower priority. With some exceptions, this has led to disappointing results for the LTAs in the building sector in the Netherlands. The LTAs are far less effective and efficient than anticipated when they were introduced by the government. The LTAs don't seem to add anything to the generic instruments like grants and fiscal measures available for the whole building sector.

Discussion and conclusions

This paper provided an overview of the 'theory-based policy evaluation' approach. The paper shows that the method has several benefits compared to other ex-post evaluation methods because:

- The whole policy implementation process is evaluated and the focus is not just on the final results (i.e. energy efficiency improvement and CO_2 reduction).
- Through the development of indicators for each step in the implementation process the "successes and failures" can be quantified to the greatest extent possible.
- By applying this approach we not only learn whether policies are successful or not, but also why they succeeded or failed and how they can be improved.

The method also has some disadvantages:

- The method requires much monitoring data in order to establish the indicator for each of the steps in the implementation process. As the method is mostly afterwards applied to the available data, often the correct data are not present, for example because surveys did not ask the right questions.
- Often it is difficult to account for interactions between instruments.

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