

# [FRANCE] “Investments for the Future” programme

## (PIA : Programme des Investissements d’Avenir)

### About the measure

Policy instrument	Sector	Starting date and status
Financial	Industry, Agriculture, Household, Transport	2010 – on-going PIA 1 [2011-2014] PIA 2 [2014-2017] PIA 3 [2018-2020]

The “Investments for the Future” programme (PIA) is a €57 billion investment programme officially launched by the French government in 2010 (see updated Finance law of March 2010 for more details) to support economic growth (target: +0.3%/y in average) by investing in R&D and innovative projects, technological research institutes, technology transfer companies and clusters. It is managed by the *Commissariat Général à l’Investissement* (CGI, General Investment Commission), a dedicated team depending on the French Prime Minister that aimed to generate fiscal benefits and ensured mid-term self-financing through financial benefits generated by such investments.

The direct management of the budget is led by different public organisms such as the national research agency (ANR), the national agency for housing (ANAH), the nuclear & alternative energies commission (CEA), the public investment bank (BPI), the deposits and consignments funds (CDC), or the French agency for environment and energy management (ADEME).

The objective of ADEME within this framework is to **foster the emergence of innovative products/services in the field of energy and environment**, and create and maintain jobs, by supporting financially their development and experimentation. The different means of financial supports are (see Figure 1):

- **Full subsidies** granted to non-profit organisations (mainly research institutes)
- **Combination of subsidies and refundable grants** attributed mainly to companies (SME’s, intermediate enterprises and large companies). For refundable grants, beneficiaries are asked to reimburse their grants (less or and even more) in case of technical success of the project and/or commercial success of the developed product.
- **Direct capital investment** (equity and quasi equity).

Except for capital investment, the granted amount is **limited to €15 million by project** (according to EU regulation about state-aid), and should **comply with criteria (technical, economic, organizational, sociological...)** detailed in calls for projects.

Since 2014, the programme managed by ADEME is organized according to two topics: “Vehicles of the Future” & “Low Carbon Energies” which includes in particular projects tackling issues related to renewable energies development, circular economy, smart grids, energy storage, eco-efficient building and industrial processes. It is based on a specific aid scheme exempted of notification for R&D&I, and environment and energy preservation.



This case study is slightly different from the other EPATEE case studies, as this programme is meant to support R&D&I. The aim of this case study is thus to **give an overview of EU rules for State aids supporting environmental protection and energy objectives, to explore methodological aspects of the evaluation of R&D&I and environment protection aid scheme, and to discuss about EU regulations &**

**directives interactions.** It is partly based on the mid-term ex-post evaluation led by *l'Institut des Politiques Publiques* (IPP, the public policies institute) in 2016 to conform to the EU obligation to evaluate large state aid programs (annual expenses  $\geq 150$  M€) (EC, 2014a) and with the contractual duty for ADEME and the State.

Expected results	Benchmark
<p>The main objective of the PIA managed by ADEME is not directly to save energy but to <b>foster the development of green economy &amp; the dissemination of green technologies</b> by reducing risks in corresponding investment. Its impacts are mentioned in the French NEEAP 2017 but they are not taken into account for the achievements of the French energy savings targets.</p> <p>Nevertheless, they contribute to meet the EED recommendation to use <b>financing facilities to support the objectives of the EED</b>, especially those <b>enabling and encouraging private capital investment, making the use of innovative financing mechanisms reducing risks of energy efficiency projects, and promoting the energy services market.</b></p>	<p>In comparison, the budget of the Japanese semi-governmental organization NEDO for R&amp;D on industrial, energy and environmental technologies was around \$1.8 billion in 2007 and around \$1.3 billion in 2017 (NEDO, 2017) of which \$660 million for investment in new energies technologies and environment and resources conservation. Its staff was around 940 persons at the beginning of 2017 (the total population of Japan was around 127 million of inhabitants). It includes an evaluation department (~15 pers.). NEDO uses multi-criteria analysis for mid-term and ex-post evaluations, and develops quantitative analysis methods, such as cost-benefit analysis to estimate the socio-economic impacts of projects (from global NPV – Net Present Value – mainly). The indicators used, particularly those relating to employment and reductions in CO<sub>2</sub> emissions, are calculated primarily from macroeconomic ratios whereas sales are estimated from official statistics data.</p>

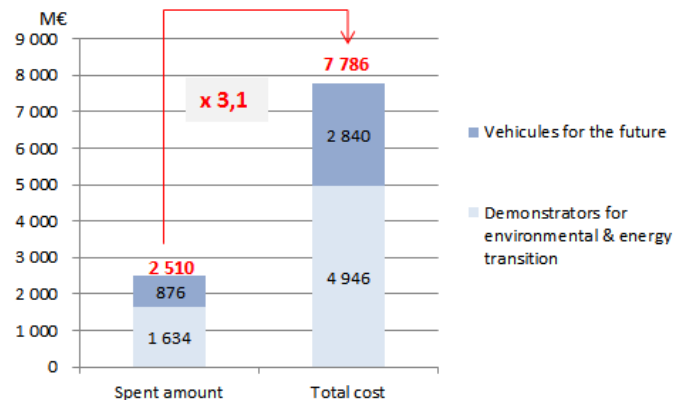
### Means and outputs



b: billion ; M: million ; Special Purpose Vehicles:

\* Budget co-managed with the French public investment bank BPI through the Ecotechnologies Fund to support capital investment dedicated to eco SMEs.

The b€1 budget granted to ADEME for the PIA3 period encompasses M€ 600 for state aids + M€ 400 for equity.  
 Figure 1. Distribution of the PIA budget managed by ADEME for the period 2011-2020 (Source: ADEME)



Source: ADEME, internal reporting (data by February 2018 – equity financing excluded)

Figure 2. Public aid and total provisional total cost of the awarded projects since the beginning of the program till February 2018.

- Granted public aid for eligible expenses: €2.5 billion (data until February 2018)
- Total provisional cost planned to be spent by projects' holders (all expenses included): €6.4 billion (data until February 2018)

The PIA cycle is composed of different types of evaluation and analysis (see Figure 3):

- A technical, economic, organizational and/or sociological analysis led by ADEME's experts to ensure the compatibility of a project proposal with the criteria of the call for tenders;
- A financial analysis of the supported companies to comply with EU rules forbidding the financial support of companies in financial difficulties;
- A financial analysis of the funding plan to ensure that the subsidies amount complies with EU rules for State aid (for e.g. that the aid does not exceed the maximum amount allowed by stakeholders category);

NB: in case of support through State Aid for the environment protection, an ex-ante analysis of the potential environmental benefits caused by the supported technology must be performed.

- For large enterprises, an economic evaluation of the incentive effects caused by the State aid compared to a counterfactual scenario must be led (ex-ante);

NB: the incentive effect of the State aid on SMEs is assumed by default.

- A market analysis to set the conditions of the aid repayment (ex-ante);
- An ex-post analysis of the projects results to check if the reimbursement must be claimed (technical and/or commercial milestones...);
- An ex-post evaluation to comply with the EU obligation to evaluate the state aid programs whose annual expenses are bigger than 150 M€ (EC, 2014a).

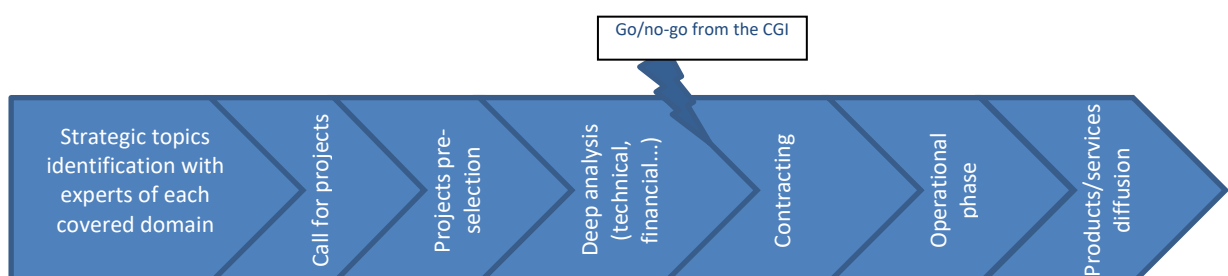


Figure 3. The different phases of the PIA (Source: ADEME)

**Over the 2010-2017 period (PIA 1 +PIA2), b€2.5 were granted for b€7.22 of total costs planned to be spent by 1387 beneficiaries** (leverage effect around 1.9), based on ex-ante estimations (ADEME, 2017). 37% of this granted amount was under the form of non-refundable aids whereas 41% were refundable aids (the remaining 22% correspond to equity funding).

NB1: the total costs per type of project are estimated before the beginning of the projects by the beneficiaries and are challenged by experts from ADEME. The real costs must be officially declared by each partner to ADEME (reporting required for the public aids to be paid). They may be validated by auditors or on invoices basis. Nevertheless, beneficiaries may declare to ADEME only their eligible costs (which not necessarily equal to the total costs) since the grants must be sized on the basis of the eligible costs.

NB2: the total eligible costs are estimated before the beginning of projects by ADEME experts with respect to EU rules, and checked by ADEME's experts before the grant payment.

**745 projects** have been supported, with an average funding of €7.2 million per project led by non-SMEs and €0.2 million per project led by SMEs. The distribution of the funding per topics was 44% for "vehicles for the future", 36% for "renewable energies, energy storage and smart grids", 11% for "buildings, industry, agriculture and vegetal chemistry" and 9% for "circular economy and waste management".

#### Sources of uncertainties or errors about the data reported

Uncertainties in project costs estimation may be due to early estimation (often many years before the projects start) and due to changes in the project (withdrawal of a partner, technical barriers causing technological changes...). Uncertainties may also be due to the very innovative level of some technologies whose development costs are very difficult to assess, and not in line with market price. This led to uncertainties in the development of the scenarios that are used to set the refundable conditions in case of commercial success. The competitive context is also difficult to assess for innovative technologies (difficult to define the pre-existing or future market for technologies not yet available on the market).

These multiple changes may also lead to errors in the monitoring database which is not systematically updated. Uncertainties have also been observed when assessing the environmental effects of the technologies compared to a reference situation (in case of projects for environment protection).

### Evaluation of the energy savings

#### Calculation method(s) and key methodological choices

The number of supported projects for environmental protection and energy identified in 2016 for the mid-term ex-post evaluation was too low to generate a sample statistically robust for an econometric evaluation. That is why this evaluation focused on R&D&I (IPP, 2017). Nevertheless, it is important to stress that the potential energy savings from energy efficiency projects are assessed by ADEME's experts on the basis of EU rules and internal guidelines to define a baseline situation (ADEME, 2015).

**The State aids granted for environmental protection or energy objectives** specifically must increase the level of environmental protection or reduce the energy consumption **compared to a level that would be achieved without the aid**. To help Members State to assess this baseline, the Commission has set **Guidelines on State aid for environmental protection and energy 2014-2020** (EC, 2014b) that require in particular the aid compatibility with the EU internal market (see Article 107.3c of the EU Treaty).

In principle, the overall impacts of such projects on energy savings could be assessed by multiplying the potential energy savings due to the supported technology (compared to a reference scenario) by

the expected number of technologies assessed for the “market development” scenario designed to size the conditions for the aid reimbursement (except when the aid reimbursement conditions are based on the technical success of the project).

- type of calculation methods used: **scaled savings (method 5)**
- type of baseline: reference scenario determined from an existing technology having the same features (for e.g. the same energy capacity when an innovative renewable technology is supported) but having potentially poorer environmental impacts
- the additionality of the projects is assessed when defining the reference scenario.

## Ex-post verifications and evaluations

The beneficiaries report data about expenses spent. However, the effective energy savings cannot be monitored or verified ex-post on short term (as they will occur after a certain time depending on technology development and time to market).

The ex-post evaluation has to follow the requirements published by the European Commission (see EC, 2014b; and *Focus on the mid-term ex-post evaluation*).

## Other indicators monitored and/or evaluated

Indicator	Explanations
Net Present Value	This indicator is systematically assessed for all the projects in order to determine the size of the grant.
Value of energy savings	This indicator is assessed ex-ante for projects supported through environmental protection and energy rules in line with Guidelines on State aid for environmental protection and energy (EC, 2014b).
CO <sub>2</sub> emissions savings benefits	This indicator may be assessed ex-ante for projects supported through environmental protection and energy rules in line with Guidelines on State aid for environmental protection and energy (EC, 2014b).

## Other aspects evaluated

The ex-post evaluation also aimed at assessing effects on R&D and business dynamics (R&D expenses, patents delivery, sales, etc.), employment, and other aspects linked to PIA objectives (for more details, see below *Focus on the mid-term ex-post evaluation*).

## Focus on the mid-term ex-post evaluation

The ex-post evaluation plan for PIA was developed by ADEME and approved by the European Commission in 2015. It specifies the broad outlines of the methodologies used by ADEME to evaluate the programme’s impacts. It includes two complementary approaches designed to cover a broad range of issues, compare the results and validate their robustness:

- An **econometric evaluation of the effects of the aid scheme on beneficiaries** (R&D expenses, patents delivery, sales, staff employment...);

- And a **quantitative-qualitative evaluation of the results and impacts of supported projects** and of the PIA programme as a whole.

These two approaches are independent of each other and **outsourced to academic experts and independent consultants**. One of the major evaluation challenges is that the evaluation results might be biased by variables other than the PIA effects and that affect the observed outcome such as general macroeconomic conditions or firm heterogeneity.

The objective of the first intermediate evaluation study was:

- Firstly, to determine the **feasibility of an econometric evaluation** of the PIA, to identify and select from amongst all types of quasi-experimental methods the most relevant one to analyse the statistical quality of the chosen sample, to choose relevant indicators and potential control groups with a processing group<sup>1</sup>.

NB: recommendations that will result from the intermediate evaluation for the final ex-post evaluation planned for 2019-2020 must reflect changes improving the evaluation procedures (sampling method, data collection and quality check...).

- Secondly, to **experiment quantitative and qualitative methods** based on data reported from a sample of 50 completed projects, and validate the reliability of the tools developed (including the online self-evaluation survey).

## 1. Econometric evaluation (provisional results)

The objective of the econometric evaluation was to report on the direct and indirect impacts of the aid scheme. Based on **Difference-in-Differences estimation (DiD)**<sup>2</sup> by comparing the performance between beneficiaries and a control group before and after the aid<sup>3</sup>, +

- Direct impacts
  - Impact of aid on the achievement of R&D&I and environmental protection objectives;
  - Increase in beneficiaries' R&D and investment expenditure in environmental fields;
- Indirect impacts
  - Positive effects: rapid development of beneficiaries' business (production, employment, productivity, etc.);
  - Negative effects: primarily the risk of crowding out private investments (measuring the leverage effect of aid on private R&D funding).

<sup>1</sup> To estimate the effect of the aid on aid beneficiaries, a counterfactual scenario was built on the most comparable firms (control group).

<sup>2</sup> Using panel data, the differences in outcome between firms over time were considered due to pre-existing differences attributed to other factors than the State aid. The change in these differences (the 'Difference-in-Differences') are attributed to the aid.

The fundamental assumption is that the differences between beneficiaries and control group are stable over time and that both groups are affected identically by common shocks during the period.

<sup>3</sup> The control group is made of firms that are individually comparable to each beneficiary in the statistical sample based on observable factors (see Figure 4).

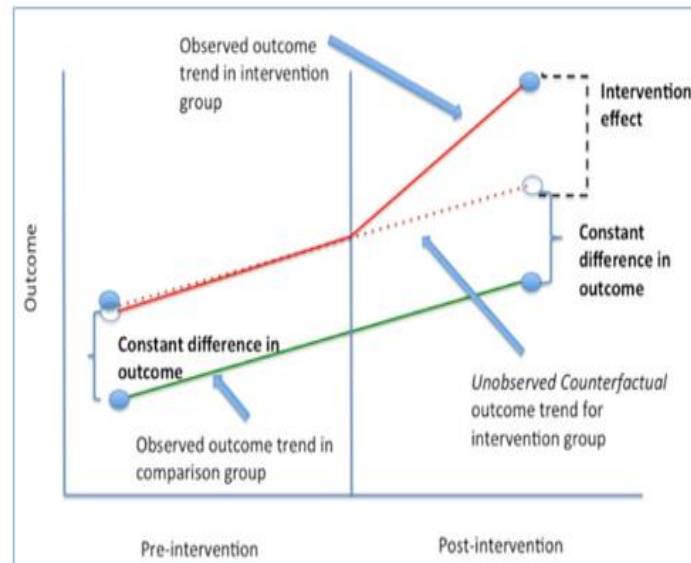


Figure 4. Principle and main assumption of the Difference-in-Differences method

The selected indicators (also called “explained variables”) are the **number of patents** filed in the R&D phase, **R&D productivity**, **total investment expenditure** including R&D&I and in environmental fields, **fiscal multiplier of public expenditure** (“Bang for the Buck” i.e BFTB ) / leverage effect, **number of jobs** created including R&D jobs, turnover and overall productivity.

NB: proxies for these variables were used when needed (poor data quality...).

The main data sources for this study were:

- Internal data regarding the funded & rejected projects
- fiscal databases (FICUS & FARE)
- annual social data surveys (DADS)
- National R&D survey performed among enterprises (low representativeness of SMEs)

The first results have shown that the **nature of the sample available for the econometric study underway does not support the interpretation of results as significant causal effects<sup>4</sup>** of the PIA on the variables of interest (proxies for R&D expenditure, R&D jobs, wage productivity, etc.).

NB: the number of supported partners monitored for the ex-post econometric study was 3081 observations (partner x project) at the first stage (883 projects and more than 1492 different partners after removing losses due to low quality).

<sup>4</sup> The causal impact is the difference between the outcome with the aid and the outcome in the absence of the aid. While the outcome with the aid is observed for the beneficiaries, the outcome in the absence of the aid is only measured for non-aid beneficiaries.

## 2. Declaration-based quantitative-qualitative evaluation (provisional results)

The quantitative-qualitative ex-post evaluation method was expected to quantify the economic and environmental impacts of the aid on beneficiary companies, as an alternative to counterfactual statistical modelling. It was based on 3 types of impacts:

- Economic: impact on the turnover of beneficiaries;
- Social: jobs created or maintained in the investment and operational phases;
- Environmental: impact on CO<sub>2</sub> emission and other impacts (waste, water resources, recycled materials) when relevant.

This evaluation was based on **declarative survey data monitored by independent evaluators and sector experts**. It was based on a number of **assumptions**, in particular the ability of partners of the same project to describe what would have happened without the project and to quantify what really happened with respect to changes in turnover, jobs created and avoided carbon emissions (as well as other environmental impacts where relevant). Regarding this last criteria, a counterfactual method was sometimes used to compare the effect on CO<sub>2</sub> emissions reduction of the proposed innovation compared to the replaced solution.

In addition to quantitative data, the method provides qualitative information on project management and the effects of aid on innovation, partnerships, collective learning, and commercial and technological opportunities. This method was designed to answer the following evaluation questions:

- To what extent are the proposed support measures best adapted to needs in the area of innovation (relevance analysis)?
  - adaptation of objectives to issues,
  - adaptation of forms of support (refundable advances and subsidies),
  - adaptation of terms of aid (amounts, conditions, time limits, etc.)
- To what extent the PIA programme operated by ADEME has produced the anticipated effects (effectiveness analysis)?
  - Mobilisation of participants and sustainability of partnerships
  - Triggering and amplifying effects on innovation
  - Emergence of new branches of activity
  - Business and job development
  - Reduction of environmental and climate impacts
- Is the programme cost-effective?

### Experience feedback from ADEME' officers in charge of the programme operation and evaluation management

#### 1. What is the role of evaluation in the management of the scheme?

There are two levels of evaluation to consider:

- The ex-post programme evaluation requested by the CGI (the French governmental organization in charge of the PIA management) European Commission to comply with the EU obligation for large state aid program and with the contractual duty for ADEME and the State;
- The ex-ante evaluation of each project (technical, economical, financial & regulatory) carried out by experts from ADEME to size the financial support.



**2. What were the main lessons learnt from the evaluations (about the impacts of the scheme and what could be improved)?**

The qualitative mid-term evaluation of the programme has helped readjustment of evaluation processes & some improvements in internal procedures for investigating and contracting projects.

The mid-term econometric evaluation performed over the period [2009-2013] has enlightened in particular many difficulties in impacts observation mainly due to the too short duration of the observation, sampling losses, non-reliable data transmitted by projects leaders (due to memory losses and lack of time & incentives for them to search for accurate data). These issues led ADEME to the design tools facilitating data collection for the programme monitoring and evaluation especially for beneficiaries of refundable aids. This mid-term evaluation has also led to more qualitative objectives enabling to explain the projects status: immediate effects (and not

only long-term effects) and to understand precisely the reasons of innovations success and failures, and especially from business point of view.

Last but not least the mid-term evaluation has also confirmed the difficulty in operationally implementing econometric methods and the difficulty in obtaining robust figures. However, it has helped understanding the causal processes leading (or not) to technological and/or commercial successes

**3. In parallel of the ex-post evaluations, are there other evaluations or studies that provided insights about the impacts of the scheme and/or possible interactions with other policies or drivers (or barriers) for energy efficiency?**

For example, the first results of the French smart grids demonstrators supported by the programme have been published in 2016 (ADEME, 2016).

**To go further**

**About the measure**

- ADEME webpage on the PIA (In English): [www.ademe.fr/en/investments-for-the-future](http://www.ademe.fr/en/investments-for-the-future)
- Webpage of the French government dedicated to the CGI (General Investment Commission) (In French): [www.gouvernement.fr/le-commissariat-general-a-l-investissement](http://www.gouvernement.fr/le-commissariat-general-a-l-investissement)
- Webpage of the French government gathering standard documents of the PIA (In French): [www.gouvernement.fr/documents-cgi](http://www.gouvernement.fr/documents-cgi)
- French NEEAP (National Energy Efficiency Action Plan) 2017: <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans>

**References of the evaluation(s)**

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- ADEME, 2016. Smart Grids: First results from French demonstrators. (available in French and English) <http://www.ademe.fr/en/node/167800>  
NB: this report gives an overview of the first results reached by the projects supported by the PIA and facing with smart grid issues.

- IPP (Institut des Politiques Publiques), 2017. Rapport final de l'évaluation économétrique intermédiaire du régime d'aides de l'ADEME IA [*Final report of the intermediate econometric evaluation of the ADEME aid scheme "Investments for the Future"*], April 2017. (not public)

## Other useful references

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