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date of receipt:	27 May 2010
to:	Mr Pierre de BOISSIEU, Secretary-General of the Council of the European Union
Subject:	Commission staff working document: "Developing the tolerable risk of error concept for the research, energy and transport policy area" accompanying document to the Communication from the Commission to the European Parliament, the Council and the Court of Auditors: "More or less controls? Striking the right balance between the administrative costs of control and the risk of error"

Delegations will find attached Commission document SEC(2010) 641.

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COMMISSION STAFF WORKING DOCUMENT

Developing the tolerable risk of error concept for the research, energy and transport policy area

Accompanying document to the

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL AND THE COURT OF AUDITORS

Commission Communication: More or less controls? Striking the right balance between the administrative costs of control and the risk of error

{COM(2010) 261 final}
{SEC(2010) 640}

1. Introduction

The purpose of this document is to present the **technical aspects** underlying the Commission's proposal for the tolerable risk of error (TRE) for the research, energy and transport policy area. It sets out statistical models for analysing the relationship between costs of controls and error rates and explains the results derived there from.

Part 2 of the paper briefly outlines the specific characteristics of the **research, energy and transport control environment** that needed to be taken into account in the modelling and to inform the decision on TRE.

In Part 3 follows the presentation of the **dataset used in the model** and its limitations.

Part 4 explains the **methodology established in order to collect costs** of control data as well as the results of this exercise. This part gives an overall description of the current situation as regards **costs dedicated to control activities in the research, energy and transport policy area** whereby control is understood in a broad sense comprising activities at all stages of a project cycle starting from the selection of beneficiaries until the implementation of audit results through the recovery of any undue payments. Such activities are classified as "control activities" where they result in decisions which influence the eligibility of an activity and/or of certain of its costs[1]. This definition encompasses the evaluation of proposals (selecting the projects to be financed, ensuring they meet eligibility criteria and the achievement of the objectives as adopted by Council and Parliament); the detailed negotiation of the grant agreement (the translation of each of the retained scientific proposals into a legally binding instrument including both scientific and financial aspects); the management of the project (verifying the outputs which demonstrate the state of advancement of the project and influence the eligibility of costs), the control of all aspects of cost claims and the control on the spot of projects and the associated costs of the recovery of any amount due as a result of the errors detected.

Part 5 provides an **analysis of the errors** found in the research, energy and transport policy group by the Court of Auditors in recent years. It presents the classification of errors according to their causes and draws conclusions there from.

Finally in Part 6 **two concrete TRE models** developed by the Commission are introduced together with their underlying assumptions. The models are used to illustrate a number of scenarios for the relationship between costs of controls and errors in order to derive **TRE range** there from.

[1] The Commission's internal control systems are based on the internationally-accepted COSO model which defines internal control as "a process designed to provide reasonable assurance regarding the achievement of objectives in effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations". (http://www.coso.org)

2. Specific characteristics of the research, energy and transport control environment

Grant expenditure in the research, energy and transport area is subject in the main part to centralised management by the Commission, either directly by the Commission's Directorates General, or indirectly through executive agencies or joint undertakings. This implies the concentration of supervision and control activities and resources within the Commission and it can be therefore concluded that the majority of control costs in this area are borne by the Commission. This was certainly the case in 2009 when the data were collected for this exercise as the two new research executive agencies (ERCEA and REA) and several joint undertakings[2] were at the capacity-building stage.

The Commission relies on project coordinators to distribute funds to project participants and to consolidate their financial and scientific reporting on the implementation of the project to the Commission[3]. Equally, the Commission relies on the accounting and internal control systems of the beneficiaries to ensure the accuracy and regularity of payments, carrying out itself desk-based checks and sample controls on the beneficiaries' premises. In consequence, the Commission, coordinators and beneficiaries may bear non-negligible costs linked to these controls[4]. These have not been considered for the assessment of the cost of controls. If the Commission was required to authorise the payments to each beneficiary, the number of payments would be roughly multiplied by 7 (7.29 is the average number of beneficiaries per FP6 project) which would render the scheme unmanageable.

Some three quarters of the expenditure in this area is via the successive research framework programmes while the rest is spent through the Trans-European Networks, Nuclear Decommissioning and other grant activities. The Commission's main instruments to provide research grants to beneficiaries are multiannual funding schemes – Framework Programmes that are based on Union pre-financing which is then “cleared” by actual costs declared by beneficiaries, which can be a year or more after the pre-financing: for this reason eligibility of costs can be finally checked only after the execution of the activity (through checks based on self declarations of contractors and – for the more detailed eligibility controls- on the spot at a beneficiary’s premises).

Rules for participation in Framework programmes define the conditions to be met by cost claims in order to be considered eligible costs and additional guidance assists beneficiaries to meet the requirements. However, the system of reimbursement of costs means that a very detailed level of proof is requested from beneficiaries (for example, personnel costs based on detailed record-keeping of the hours spent by each staff member on a project and on the detailed recording of all salary and other costs actually paid to the individual concerned). As recognised by the Court of Auditors, such requirements mean that beneficiaries’ cost statements are inherently error prone.

In practice, given the complexity of the control of eligible costs, the fact that the payments are made on the basis of self-declaration where no supporting documents are requested in advance means that detailed control of cost claims is most often carried out on the spot (on a sample basis) where the auditor has access to all of the necessary supporting information. To this extent Commission services have established a resource intensive on-the-spot control

[2] IMI, Artemis, Clean Sky, ENIAC, FCH.
[3] Hereinafter we will refer to both coordinators and project participants as "beneficiaries".
[4] Part of such costs may be reimbursed in practice as overheads.

strategy having a multiannual control objective to bring the residual level of error from on-the-spot controls below 2% at the end of FP6 (end of 2010). In spite of major control efforts, as indicated in 2009 Annual Activity Reports of the relevant DGs, and based on current information, it is not certain that this objective can be reached: the current multi-annual error rate for FP6 reported by the concerned DGs in their 2009 Annual Activity Reports is higher than 2% even taking account of the fact that nearly 1,900 FP6 audits have been carried out by the Commission.

Other than Framework Programmes expenditure concerns mainly Trans-European-Networks and Nuclear Decommissioning. These activities as well as their control systems differ from those for the Framework Programmes. For example, for nuclear decommissioning, the expenditure is either channelled through implementing bodies such as a certified agency with full state guarantee or administered through joint management (with the EBRD). Noticeably fewer errors are found by the Commission in these areas.

3. The Dataset used in the model and its limitations

The Commission's proposal for tolerable risk in this area is based on two dimensions: the costs of control and the capacity of these to detect (and correct) errors. Costs of control used in this analysis are the result of an extensive data collection exercise within the Commission Directorates General and Executive Agencies dealing with the relevant programmes. Data on errors is essentially based on error rates detected in 2008 by the Court of Auditors in the policy groups covered by Chapter 7 of its Annual Report (Research, energy and transport).

The error rates found by the Court of Auditors have been broadly comparable with the multiannual, residual levels of error for FP6 found by Commission services in recent years[5]. While the latter could have been used as a basis for this analysis, they are an integral part of the control system and could themselves have been perceived as biased. It was therefore decided to use errors coming from the Court as they are fully independent from the Commission's internal control system.

The research policy group (as defined by the Court in Chapter 7) comprises payments from budget titles: 06 (Energy and transport), 08 (Research), 09 (Information and Society), 10 (Direct research). For the purposes of the modelling presented in this document, a number of **assumptions** needed to be made in order to align both sets of data enabling comparability (see below annex 2).

The remaining payments in 2008 (extracted from the Commission's accounting system per project coordinator/beneficiary[6]) were made to over 5,500 entities and represented around €7,2 billion of budgetary expenditure. By far the biggest proportion of this expenditure belongs to the 6th and 7th Research Framework Programmes (*76 %*) as set out in Figure 1 below:

[5] Three Directorates General managing the expenditure under FP6 reported in 2009 the residual error rates in FP6 of: 2,7%; 2,21%; 4,04% as reported in their Annual Activity Reports 2009.

[6] The accounting system provided data on payments made for coordinators in framework programmes and beneficiaries for other areas (for example non-research energy and transport).

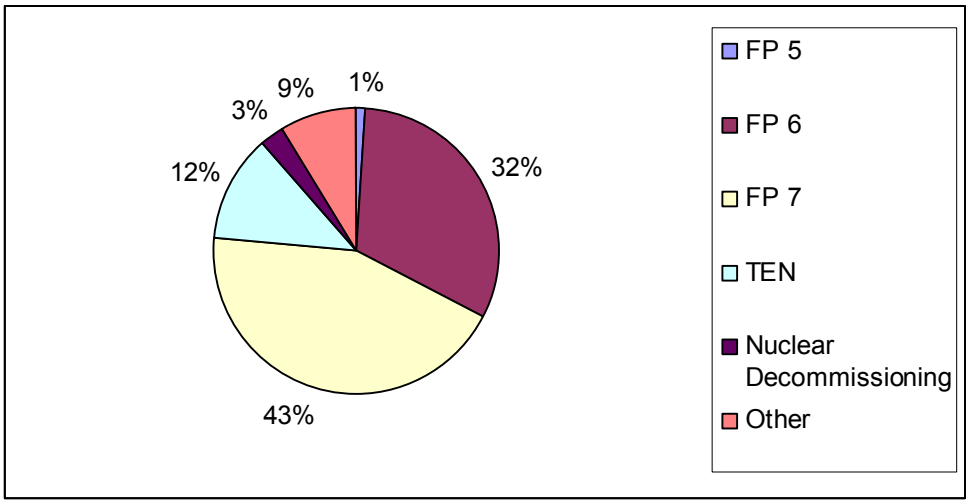

Figure 1: Breakdown of payments in 2008 as used for this Commission proposal and their share in the total of €7,2 bn. (*Source, ABAC*)

It needs to be underlined that, for projects with more than one participant, the models use payments to coordinators (for simplification purposes) but that the Commission is expected by the Court to ensure accuracy of payments to each beneficiary (by the coordinators) and that the Commission remains responsible for inaccuracies and control deficiencies by the beneficiaries.

For the budget lines included in this population, the errors detected by the Court in 2008 were identified[7]. There were 23 quantifiable errors which were taken into consideration and the corresponding average error rate (most likely error) amounted to 2,99[8]%. Whereas most of the payments related to FP7 (43%), none of the errors identified by the ECA in 2008 concerned FP7 as this was principally pre-financing which has a very low risk of error. The errors were concentrated on FP6 (20 of the 23 errors).

4. Methodology and the results of the collection of costs of control exercise

The methodology for the collection of costs was based on the distinct phases of the management of a project: selection, negotiation, project management, on-the-spot audits and implementing of audit results. At each of these stages, controls are embedded in the administrative procedures to prevent, detect or correct potential errors and weaknesses. They constitute the essential steps in ensuring that grant agreements are signed with eligible beneficiaries for eligible activities, that the outputs of projects are satisfactory and that cost claims submitted are in conformity with the rules. The table below sets out a description of the tasks treated as control activities associated to different phases of the project cycle and the reasoning for their inclusion in relation to the general control objectives at the relevant project stage:

[7] The ECA audited for Chapter 7 150 transactions selected in MUS sample in 2008.

[8] One of the errors related to the Chapter 7 (of MEDIA programme) was not taken into account in the basic model due to the fact that the relevant funding programme was moved to another Directorate General of the Commission (which will participate in a subsequent TRE exercise), however its impact was included in a part dealing with the sensitivity analysis.

Phase of a project	General control objective	Main tasks
Selection of proposals	To ensure that the proposals selected for financing are characterised by scientific excellence, will fulfil the operational objectives set out in the specific work programmes and will provide the best value for public money	○ preparation and definition of work programmes ○ planning and coordination of the calls ○ the evaluation of proposals received – screening of submitted proposals for their eligibility ○ preparation of the final list of proposals
Negotiation of contracts	Proper translation of each retained scientific proposal into a legally binding instrument – grant agreement	○ clarification of the work to be carried out and operational objectives of projects ○ estimation of costs (determination of EU contribution) and duration ○ preparation of the projects' draft contracts ○ validation of the legal status ○ financial viability control (when necessary)
Project management	To ensure, prior to final payment, that all applicable contractual and regulatory requirements (of operational and financial nature) have been respected	○ check/ approve of financial and scientific reports ○ financial management tasks: preparation and execution of payments ○ ex-ante operational and financial initiation and verification
On-the-spot audits	Control objectives of on-the-spot audits are twofold: to provide an adequate indication of the effectiveness of ex-ante controls and to ensure the accuracy of the expenditure and therefore the legality and regularity of underlying transactions on a multiannual basis. It is a key element of the control strategy for research	○ work of on-the-spot audit units ○ work of operational units in terms of preparation of the documentation for audited projects ○ organisation of contradictory procedures with beneficiaries ○ work performed by external audit companies ○ consultation with legal units on the eligibility of specific expenditure
Implementation of audit results	To ensure that audit results are properly implemented, amounts due are recovered and identified weaknesses addressed	○ preparation of forecasts of revenue, recovery orders, proposals for extension of findings to non-audited areas ○ exchange of correspondence with beneficiaries ○ adoption of enforced recoveries ○ waive, cancellation adjustments of recovery orders

Table 1: General control objectives and tasks at different project stages.

In order to obtain reliable data on the costs of control by Commission staff, the Directorates General and Executive Agencies in the research policy group[9] applied the same methodology[10] to estimate staff resources carrying out the defined control activities. These staff resources were calculated as "full-time equivalents" and the costs derived from applying the standard average personnel cost used for human resources estimates in the Budget. These costs are €122.000 for an official and €64.000 for an external agent.

The costs of control also include external costs: these comprise the cost of audit certificates in the Framework Programmes that were taken into account[11] whenever relevant and feasible. The cost of audits of projects by external providers on behalf of the Commission is also included. Costs borne by beneficiaries were not included in the collection exercise as these are independent from the Commission's and performing an additional cost collection exercise including all beneficiaries (or even a sample) would have been time and resource intensive. However it needs to be borne in mind that the higher administrative burden associated with the level of controls carried out on beneficiaries (and the higher the level of associated costs), the more likely they are to discourage participation in EU programmes.

It is important to note that in the models that were developed (as presented below) in the short to medium term solely marginal costs influence the estimated level of TRE.

As per the above methodology established by the Commission, the **cost of control in the research, energy and transport policy group totalled around €267m annually**.

Whereas it was decided to base the statistical model on the payments relating to the policy group area from the Chapter 7 of the ECA's annual report, the analysis of costs of controls presented below is broader as it concerns all "traditionally research" Directorates General[12] of the Commission and the Executive Agencies. The models presented however exclude those costs related to activities not included in the Court's Chapter 7.

The figure 2 below presents the structure of annual costs of control in research, energy and transport spent within the Commission. The bulk of the total costs (43%) is borne at the stage of project management, second largest amount is spent on selection of proposals (18%) followed by negotiation of contracts (16%).

[9] Commission services that took part in the exercise: RTD, INFSO, TREN, ENTR, REA, ERCEA, TENTEA, EACI

[10] One of the Executive Agencies decided to use different but comparable methodology, which was justified by the fact that they deal with grants falling into different Chapters of the ECAs Annual Report and it would have been difficult to make a distinction

[11] For FP6 audit certificates were obligatory for each beneficiary, for FP7 only for beneficiaries receiving per reporting period more than 375.000 euro. Costs spent by beneficiaries on external audit certificates are treated as eligible and are reimbursed by the Commission.

[12] Although data concerning DG ENTR did not feed into the model (as they are not part of the current Chapter 7) they do manage the expenditure under the framework programmes.

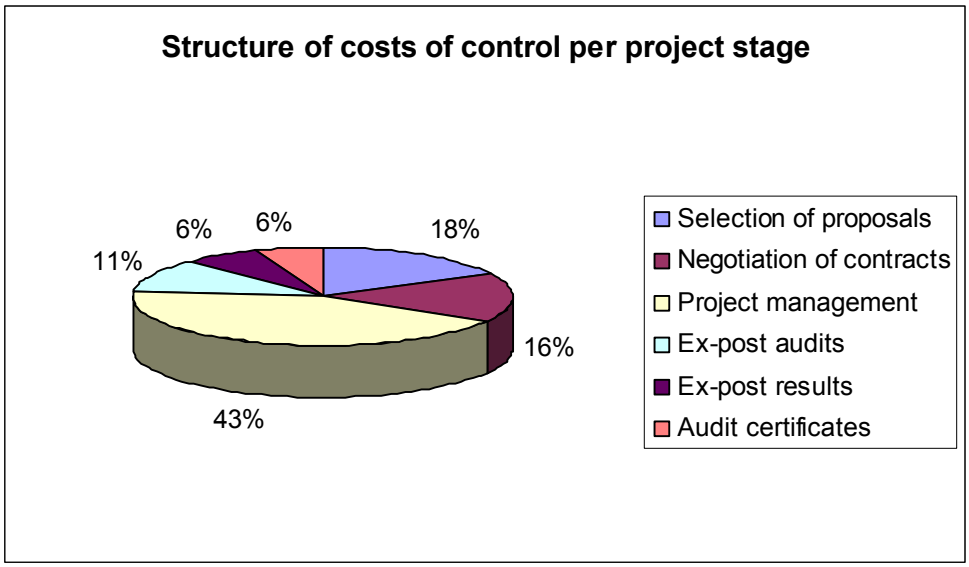

Figure 2: Structure of costs of controls per project stage for the research, transport and energy policy area, including Commission Services: RTD, INFSO, TREN, ENTR, EACI, EACEA, ERCEA, REA, TEN-TEA.

The wide definition of controls used for this exercise was in line with the COSO[13] definition of internal control, which inspired the internal control framework in the Commission. These controls are not limited to checks and verifications but include all the measures management and staff take to ensure the effectiveness and efficiency of the operations as well as the legality and regularity of the underlying financial transactions.

5. Analysis of the errors found in research, transport and energy policy group by the Court of Auditors

Each year the Court of Auditors selects and audits a sample of transactions for each policy group underlying the Chapters of its annual report. Based on the result of its audits (as well as on the assurance derived from the functioning of the respective supervisory and control systems), it gives a specific assessment on the legality and regularity of underlying transactions. Errors that the Court finds are classified as either non-quantifiable (for example an inappropriate tendering procedure or non-respect of the deadlines set by the regulation) or quantifiable (as for example declaration of ineligible costs by a beneficiary).

For the purpose of this current exercise, all errors that the Court detected in 2007 and 2008 for research, energy and transport corresponding with the dataset on payments as presented in part 3 were analysed. For the purpose of establishing the TRE model only quantifiable errors have been taken into consideration as only they have a direct measurable impact on the value of the underlying transactions.

Figure 3 below provides an overview of the main types of errors. The errors reported by the Court were divided into two broad categories: those with an impact on the error rate and those without. Reported errors with an impact on the error rate are further divided between errors originating at the beneficiaries and those for which a root cause lay with the Commission.

[13] The internationally recognised COSO framework - http://www.coso.org/

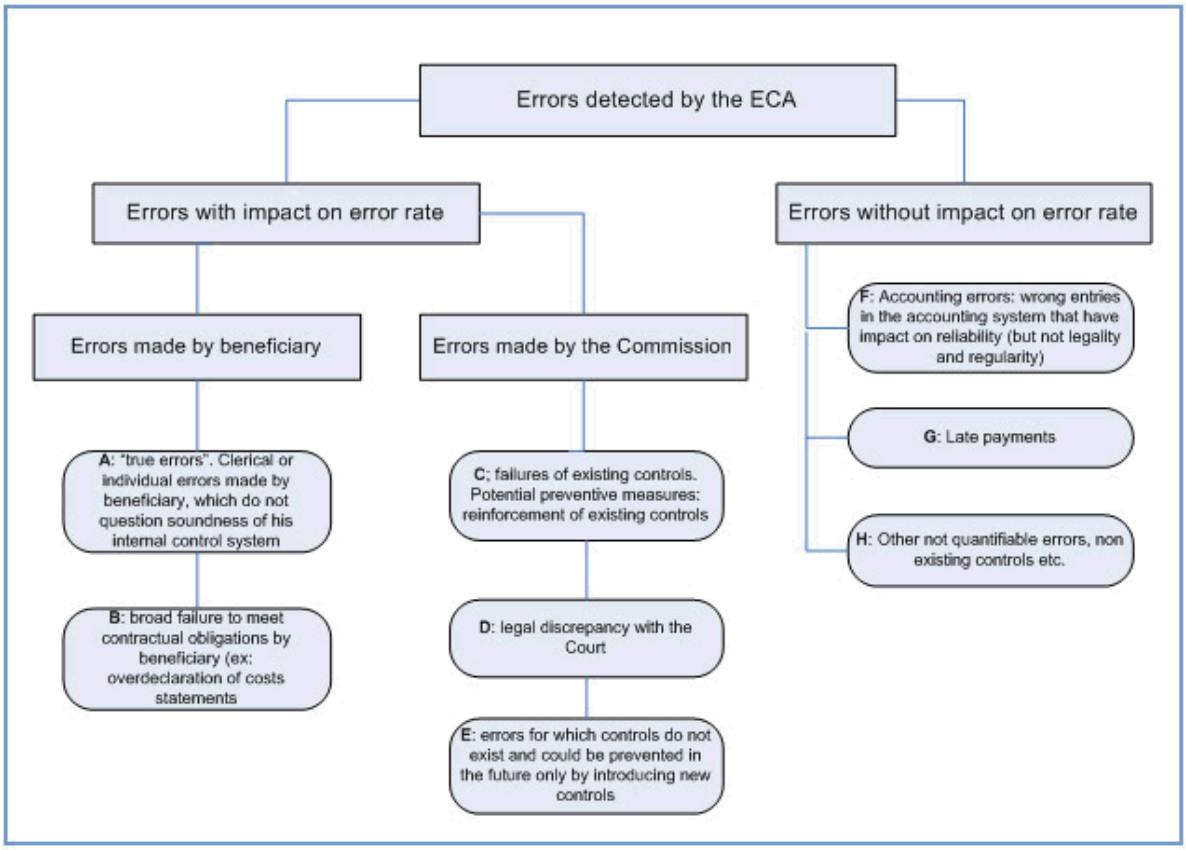

Figure 3: shows that errors were classified into eight groups.

The primary and crucial conclusion from the classification of errors into the above categories was that there was a certain level of error which cannot be reduced – due to differences of interpretation between the Commission and the Court or to issues for which the Commission has decided that controls would not be possible or cost-effective. This concerns in particular errors of category D and E mentioned above. Analysis of DAS 2007 and 2008 shows that such errors may account for an error rate in excess of 1% - that is to say more than half-way towards the 2% threshold.

For errors caused by legal discrepancy with the Court (category D) the Commission considers that no control failure occurred (thus it could not have been avoided in advance). For errors for which there were no adequate controls put in place, remedial measures for preventing similar errors in the future would require introduction of new controls. These new controls can prove costly to implement (even to the extent of being cost-prohibitive) or their introduction may not diminish errors in the short term (for example due to previously defined regulatory interpretations). This analysis therefore confirms the intuitive impression that a "zero-error" situation is virtually unachievable and a certain level of inherent error needs to be accepted even before taking account of control costs.

An additional argument that **a 'zero error' situation is not achievable** comes from a cost benefit analysis of the on-the-spot audit effort. There were over 5,300 payments in this policy area to beneficiaries of research and other grant programmes in 2008. For research framework programmes, payments are made to coordinators which make payments to project participants (over 7 per project on average). This means that payments were made in respect of cost claims related to some 35,000 individual participations in 2008. Controlling each of these on the spot would cost some €2 billion.

For DG Research, even with such extensive audit coverage, the residual error rate would remain close to 1%. The expected actual recovery (as opposed to the error detected) from each audited beneficiary is around 1,63% of the EU contribution. This implies that it is not cost-effective to audit beneficiaries with a cumulated EU contribution below € 3,7m because under this threshold, the expected value of error is less than the marginal cost (€60.000) of detection and correction through an on the spot control. The number of beneficiaries below the cost-effective audit threshold is over 14.480. If we apply the Court's error rate of 3%, this would mean that an error rate of 0.96% of the total EU contribution in FP6, cannot be cost-effectively detected and corrected.

The above analysis implies that almost 2% of error may be unavoidable (at least at reasonable cost) as some 1% relates to differences of legal interpretation with the Court and 0.9% to beneficiaries which it is not cost-effective to control on the spot (even though some control should be carried out on some of them for deterrent effect).

Another significant finding of this analysis shows that most of the errors with a financial impact (A and B category) could have been avoided only by controlling the project on the spot. Improving desk-based ex-ante checks proved to be the solution for only a very limited number of cases (in about 6% of errors). This argument is backed-up by the fact that the Court considers the desk-based ex ante controls before payment in FP6 to be effective[14].

Figure 4 below shows the structure of errors per typology defined above

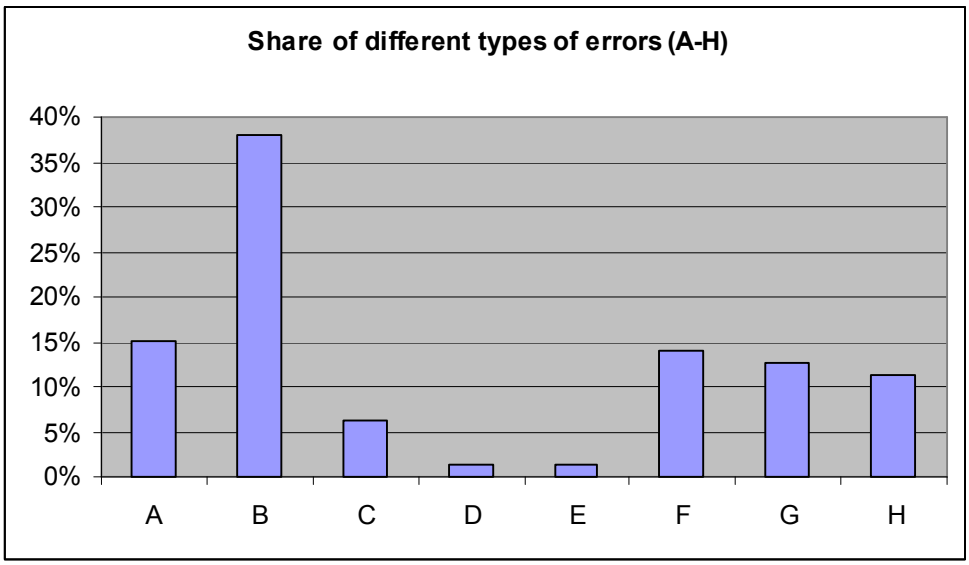

Figure 4: Different types of DAS errors per typology established by the Commission. In order to even out potential abnormality of a given year, an average of two years (2007 and 2008) was taken.

6. Modelling the relationship between the costs of control and errors – description of the models and results they provide

The DAS is based on the internationally-accepted Monetary Unit Sampling (MUS) methodology, the most commonly-used statistical sampling method in auditing (and one which is used by the Court of the DAS). In this approach the auditor:

[14] Court of Auditors Annual Report 2008, Chapter 7, Table 2.1 Assessment of selected supervisory and control systems, pg 154. Court audit of ex-ante desk checks concerned one of research DGs (DG INFSO).

- decides what level of confidence is required from the sample (effectively, the probability of the results of the sample reflecting reliably the situation across the whole population) and the materiality level (which sets a degree of tolerance in the accuracy of the underlying transactions). The Court, in line with common practice, uses a 95% confidence level and a 2% materiality rate;
- fixes the level of assurance he will draw from the quality of the systems in place (if he considers the systems as effective, he may draw some of the 95% overall confidence level from these systems: if not, the whole 95% is provided by the examination of a sample of transactions);
- calculates the sample size required based on the confidence level, materiality level and the assurance drawn from systems and selects the sample of transactions accordingly; and
- audits the selected transactions, records the results and uses statistical techniques to estimate the level of error in the population as a whole.

The statistical basis underlying MUS is the "normal distribution"; which means that (for a confidence level of 95%) there is a probability of 95% that the actual error rate across the whole population of the transactions will be within two "standard deviations" from the apex of the distribution curve. This apex is called the "Most Likely Error" (MLE) and represents the best estimation of the error rate. However, as some uncertainty is involved in assessing the results of any sampling, this uncertainty is expressed by two extreme points (the Upper Error Limit (UEL) and the Lower Error Limit (LEL)): respectively, with a 95% confidence level, there is a 2.5% probability that the actual error in the population is higher than the UEL and a 2.5% probability that the actual rate is lower than the LEL (see Figure 5 below).

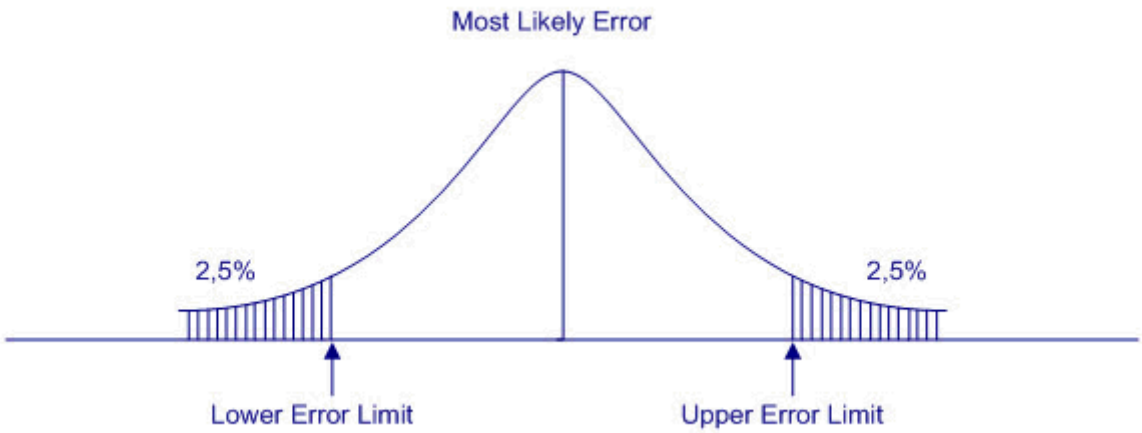

Figure 5: MUS curve – in 2,5% cases the real error in the population may exceed the upper error limit and in 2,5% cases the error may be actually smaller than the lower error limit.

Two models were created for the purposes of this concrete proposal. The first was based on achieving a given UEL. This was used notably to identify the cost of control to obtain a virtual guarantee that an error rate of less than 2% could be achieved. The second model was based on the cost of achieving a given MLE, which is the benchmark used by the Court: of course in this scenario there would be a 50% probability of the error rate being greater than the MLE.

The population used for the model concentrated on the latest (2008) DAS, for which 23 errors with financial impact were detected by the Court (categories A-E) in this area. The value of these errors as a proportion of the total payment audited ranged from 0,72% to 95,23%. Extrapolated to calculate an error rate for the whole population (that is including both transactions affected by error and those which were error-free), this gave an overall average of 2,99%.

The two models described below examine how the average error in the population of payments in 2008 might have changed if more or less had been spent on controls. They are of course only **indicators** of the potential relationship between control and undetected error. They involved the use of several assumptions:

1) all identified unduly paid amounts are immediately recovered (whereas in reality there is a time lag between detection and recovery and some amounts may be waived or cannot be recovered)

2) the assumed error rate is an average based on the DAS error rate - the same for all beneficiaries: if an audit is performed the amount recovered (in the basic model) is 2,99% of the audited amount (whereas in fact some audits may result for example in 0% or 100% error rate)

3) the assumed error rate for all beneficiaries is defined as fully systematic (that is that the same error is repeated across all programmes of the same beneficiary) whereas in reality it has a **systematic and non-systematic component** in itself. Commission audits generally involve the verification of a sample of a beneficiary's cost claims, the identification of errors and the recovery of these. Where an error is likely to have affected non-audited cost claims, the Commission may invite a beneficiary to reimburse an appropriate sum related to these costs claims or it may ask the beneficiary to restate these cost claims to remove the impact of such systematic errors. The Commission's audits on FP6 have shown that the non-systematic errors account for a significant proportion (1.63%) of the actual error rate detected. The Commission's model however assumes that audits will clean each beneficiary of error (that has fully systematic nature) and therefore overstates the "cleaning" effect of audits (and correspondingly underestimates the likely cost of removing errors from the population).

Several simulations were performed based on variations in the criteria used: for both models therefore more than one scenario is presented.

The statistical models introduced below are based solely on **cost-benefit considerations** and do not include key political aspects which also need to be taken into account in fixing the TRE level. The dataset (as described in detail above) consisted of payments to over 5,500 beneficiaries for a total amount of €7,2 bn . In line with the analysis of errors presented above, it is assumed that errors can only be detected "on the spot". Costs spent on controls are therefore to a large extent fixed in the short-term (€200m) and the marginal cost is calculated by adding or removing on-the-spot audits. From the empirical data[15] an average cost per audit amounting to €60.000 (including the cost of the resulting recoveries) per project participant was calculated and used in the models presented below.

[15] Average cost of an audit per planning audits in FP6 audit strategy.

In the models the benefits of controls are defined as recoveries from audits performed on-the spot, however it needs underlining that not all error amounts established in the course of audits can be actually recovered by the Commission and some may be waived or be simply unrecoverable due to the financial situation of the beneficiary. Model 1 (as described below) is focused primarily on achieving a 2% error rate and does not seek the maximisation of benefits of controls at all costs. Model 2 takes account of the benefits of control by means of calculating "a yield" for each coordinator defined as the difference between amounts recovered from the audited coordinator and costs spent on controlling this coordinator (on the spot controls are carried out when the yield is positive: the expected recovery exceeds the cost of the individual control).

6.1. MODEL 1: achieving a given UEL

To give a virtual guarantee of achieving a "green light" (under 2% error level) in this Chapter of the Court's report, the Commission would need to carry out sufficient controls on the spot to make it almost certain that the Upper Error Limit was 2%. This model estimates the level of marginal costs (on top of the existing ex ante controls) that would need to be spent to guarantee a level of error in the population of 2%. For comparative purposes the costs of achieving a given MLE were also examined.

The model took the 2008 population of payments and calculated the cost of control based on audits in the year of all of the largest beneficiaries together with sample-based checks on the remainder. Several scenarios were used, assuming audits of different numbers of the top beneficiaries with a sample of the remainder. Figure 6 below illustrates the results of the different scenarios:

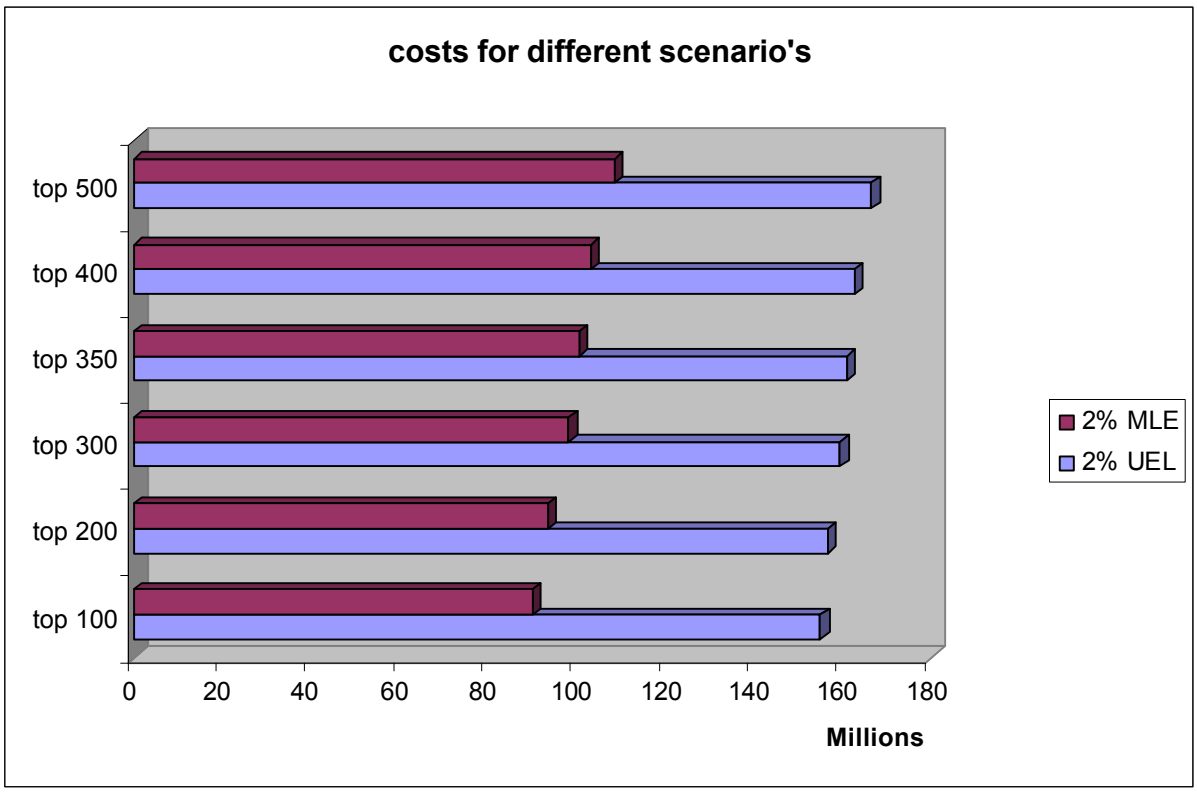

Figure 6: Model 1 presents scenarios to achieve levels of MLE and UEL of 2% by controlling on the spot the top 100, 200, 300, 350, 400 and 500 beneficiaries and a sample of the remainder.

Figure 6 illustrates an incremental rise in costs of control related to additional audits that need to be executed on the spot. It should be noted that the fixed costs of €200 million (those of the other stages in the control chain) are unaffected by this analysis.

The way of virtually guaranteeing a "green light" would be to carry out enough control to deliver a UEL of 2% (as explained above - a situation when we are more or less sure that the error found in the population will not exceed 2%, the MLE at this stage is almost 0%). Regardless of the chosen audit strategy (whether we audit top 100 or top 500 beneficiaries) costs that would need to be spent on controls to achieve 2% (an equivalent of DAS green light) would be considerable – ranging from €155m to €166 m. The cost of being sure of achieving the 2% benchmark would therefore be prohibitive (at over €150 million). Even the cost of achieving an MLE of 2% is considerable (at over €90 million), compared with what is being spent currently on on the spot controls (less than €50 million) to arrive at an error rate of almost 3%.

The above analysis is based on one year only – 2008. In order to have a wider field for examination and results there from, **the data from 2007 was introduced to the model.** Several parameters needed to be adapted, such as the number of sampled transaction for the policy group (180 instead of 150 in 2008), number of payments per beneficiary, average error detected (higher in 2007 than in 2008). Succeeding calculations revealed that in order to obtain a guarantee of having in the population an error not higher than 2% (ULE) even more resources would need to be spent on additional controls - around €190m. This result exceeds the outcome for 2008 substantially, in large part due probably to the higher error rate in the DAS 2007 for this Chapter. This in turn was possibly partly due to the fact that the numbers of on the spot audits by the Commission increased significantly between 2007 and 2008 and it could therefore be expected that the Commission "cleaned" more projects of error in 2008 than in the previous year. Additionally, the proportion of final payments was increasing as FP6 came into full swing (typically final payments are the most error prone ones as it is at this stage that the actual costs of a project are finally verified). Further analysis also suggests that the decrease in the error rate in 2008 might have been due to phasing out of FP5, which in contrast to FP6 did not include an audit certification policy.

6.2. MODEL 2: targeting the MLE

The second model is based on the most likely error, using the same basic data as for Model 1. The basic principle, following statistical theory, is that each Euro in the population of payments in 2008 was affected by the same percentage of error as the population audited by the Court (2.99%). This percentage was converted into a "yield" per beneficiary: defined as the difference between the assumed recovery from an audit (calculated as 2.99% of the total payment to that beneficiary) and the cost of auditing that beneficiary. The cost of auditing a single beneficiary was calculated on the basis of the audits carried out in the research policy group relevant to the established dataset in 2008 (733) and the costs related to on-the-spot controls (including recovery of errors detected): €60.000. For the purposes of the exercise it was assumed that the remaining control costs were "fixed" as on-the-spot control was identified as the principal tool for detecting and correcting errors.

A curve can then be derived with multiple points which can be used to calculate the cost of "adding" individual on-the-spot controls, increasing the cost and reducing the error in that beneficiary. The ranking of the beneficiaries for this curve can be done in two ways: in the best-case scenario we assume that we will visit the beneficiaries with the highest yield first

(assuming the localisation of errors is known), in a second case we choose the beneficiaries to be audited randomly.

Scenario A: MODEL 2A "best-case scenario"

In the best case scenario the beneficiaries were ranked ranging from the ones bringing the highest yield to the lowest. So the errors that are subsequently removed are removed in the most cost-effective way. At the start point we have an error rate of 2,99%. In order to reach an error rate of 2,9% we need to get rid of 0,09% error in the population of €7,2 bn spread over 5538 beneficiaries, which means that we would need to recover additionally (0,09% * €7,2 bn) €6,5m euro. In such a way we progress moving down from the initial level of error of 2,99%, through auditing additional beneficiaries and reducing the error rate.

Scenario B: MODEL 2B "random selection"

In this scenario the coordinators were not ranked by yield, their selection was random. The random simulation was run 1000 times, which gave a straight line with 10 individual points, at each of which the corresponding cost of controls can be derived. More points could be generated on this line but this would not change the overall results.

Scenario 2AB: scenarios 2A and 2B combined – TRE range

When the product of models 2A and 2B are combined, one could confidently presuppose that the TRE point would be located somewhere between the best-case scenario and a more real-life (random) situation described above. The corresponding results are set out in Figure 7 below. This shows that the best-case scenario, which assumes we know where the errors are located, would be highly cost-effective in reducing the error: the reduction to 2.5% error rate would cost less than €1 million. However, the random scenario, which can effectively be considered as a "worst-case" scenario (as the Commission does have information which enables it to target risks), would imply a much higher cost to reach the same 2.5% target (some €55 million). The range between these two figures is very wide: however, it is not unreasonable to assume that the cost of reducing the error rate (MLE) to 2.5% could lie somewhere towards the median of the range €1 million to €55 million: somewhere around €28 million. This would imply increasing the current cost of on-the-spot controls by almost 80%. The chart below visually presents two, combined scenarios for the Model 2 with the TRE range lying between the two lines.

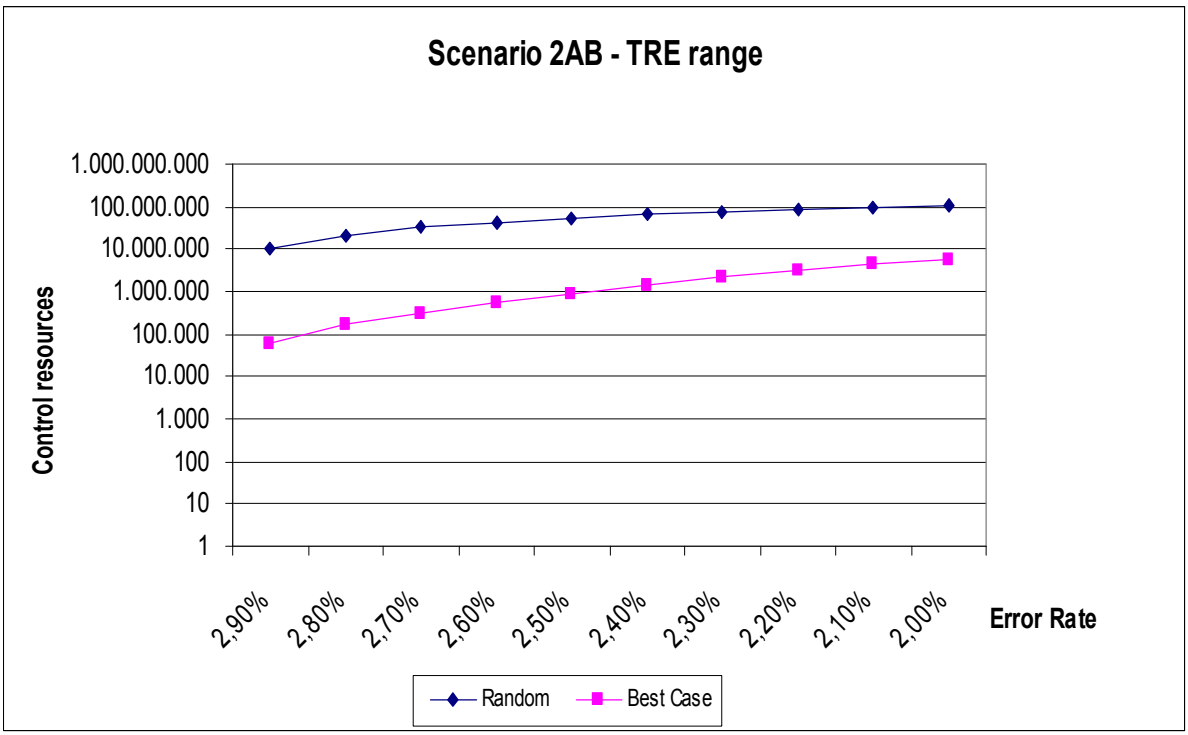

Figure 7: TRE range between the best case and random scenarios

The curves relate to the best-case scenario and a given random scenario for the Model 2. They present the reduction in the error rate, which is achieved by dedicating additional resources for control. A logarithmic scale (also know as ratio scale) has been used when plotting the "y" values in order to reduce the large range of values[16].

Scenario 2C: "reducing the costs of control"

To provide fuller information for the inter-Institutional discussions on the concrete level of TRE in this sector, the Commission services also examined what might happen if the number of on-the-spot controls were to be reduced, thus accepting a higher error rate. This is also a quasi best-case scenario. In this case the beneficiaries were ranked, starting from the one who brings the smallest yield (beneficiaries with the lowest amount of error to be recovered by the Commission).

This analysis gives indicative error rates for achieving a given (higher) MLE than that of the Court. The costs associated can be assumed to be the minimum to achieve the given level and are (as explained earlier) incremental. The table below presents different (higher than the current 2,99% MLE) levels of error that could be implied by spending less on on the spot controls (by diminishing number performed).

[16] A logarithmic scale is a scale of measurement that uses the logarithm of a value instead of the value itself. Logarithmic scales have been explicitly designed to reduce large range of values to a more manageable range. The logarithmic scale used here is one in "factors of ten" which makes use of so-called decades on the vertical axis. A decade is a factor of 10 difference between two numbers (as order of magnitude difference) rather than unit steps.

Error rate	Reduction in control costs
3,5%	€8 million
4%	€15,5 million
4,5%	€22 million

Table 2: predicted higher error rates corresponding to reduced costs of controls

6.3. The implications of the analysis for a TRE level

The analysis above shows that guaranteeing an error rate of 2% would be prohibitive in cost terms. Likewise, any reduction in the current error rate could be costly to achieve and would be unlikely to be cost effective. Of course, the error rate will evolve year-on-year as the balance of framework programmes and other activities change: and statistical sampling also has its own uncertainties which can affect the error rate in a given year. The Commission services also believe that Framework Programme 7 (for which most payments to date have been low-risk pre-financing) could be more error-prone than FP6 when it comes to treating cost claims due to the reduction in the numbers of audit certificates and the low number of beneficiaries eligible for the acceptance of their personnel costing methodologies (which would permit the claiming of average personnel costs rather than actuals, thus reducing the risk of error). As a result, it would be prudent to fix a range for TRE. This could be reconsidered in the light of any major changes in the control environment.

It is clear from the above that the TRE level should be fixed in the current "yellow" zone of the Court: analysis by DG Research has indicated that reducing the multi-annual error rate for its payments alone would cost some €126 million for FP7 (2,100 audits multiplied by €60,000 unit cost). The analysis above indicates that reducing the current MLE significantly would be likely to be costly. Similarly, the 2008 error rate of 2.99% may evolve as FP7 comes on-stream and the higher inherent risk may influence the error rate upwards.

In this light, the Commission proposes a TRE level in the yellow range (2%-5%). A DAS error rate around the middle of this range would be acceptable and justified. Beyond this level, additional action would be taken to reduce the error rate through increased controls addressing the major causes of error and taking into account the multi-annual nature of the expenditure. This rate should cover all Research Framework Programmes irrespective of the Chapter of the Court's annual report in which they are included as well as all activities included in this analysis even if they are reallocated to other Chapters of the Court's annual report in future.

Fixing a tolerable rate of error higher than 2% could allow a fundamental refinement of the current control strategy. In particular the magnitude of controls (audit coverage) and focus could be addressed with a view to lower the control burden both for the major beneficiaries (where this is cost-effective) and the Commission (and thus reduce the disincentive to beneficiaries to participate in Union programmes). Whilst maintaining an adequate level of representative controls (to support the regular need for assurance on sound financial management), such a revised control strategy would allow to focus less on audit coverage and more on targeted risk based audits and fraud prevention controls. On such basis, a sufficiently solid accountability framework could be ensured whilst maintaining a sufficient deterrent to

irregular use of EU research funds. As a result, scarce financial and human resources could be reoriented to other priority research policy areas.

Annex 1: Glossary

Audit certificates: independent certification of the costs incurred and claimed under the FP6 project for a given period. Their purpose was to give the Commission reasonable assurance that eligible costs are claimed in accordance with the relevant provisions of the contract. The auditor must be competent and independent from the contractor. The Certificate on the Financial Statements (CFS) in FP7 replaced the FP6 Audit Certificates. FP7 introduced also additional notions of audit certificates.

Ex-ante verifications: all checks put in place by the authorising officer responsible in order to verify operational and financial aspects of an operation prior to its execution. The purpose of this verification is to ascertain compliance with the applicable provisions and the principle of sound financial management.

Framework programmes: since 1984, research and innovation activities of the EU are grouped in one large programme called the Framework Programme (FP). Research framework programmes are the EU's main financial and legal instruments to implement the European Research Area. The current FP7 (2007-2013) is designed as a key contribution to the EU's strategy for growth and jobs.

FP6/7 audit strategy: audit strategy established jointly by the Commission's research services in order to assess the legality and regularity of financial transactions under FPs and provide the basis for corrective and recovery mechanisms and, in particular, to eliminate errors occurring in the cost statements provided by the beneficiaries. It aims at reaching the residual multiannual level of error of 2% by the end of the Programme.

Full time equivalent (FTE): ratio used to measure a person's involvement in an activity. FTE = 1 means that the person is equivalent to a full-time employee; whereas an FTE = 0.5 indicates that the employee works only half-time on a certain project (e.g. on performing a control activity).

Most Likely Error (MLE): an error that is equivalent to the best estimation using statistical techniques of an error that can be found in a population having a normal distribution. It is calculated based on the errors found in an audited sample.

Monetary Unit Sampling (MUS): a method of statistical sampling used to assess the amount of monetary misstatement in a population. It is the most commonly used sampling method in auditing.

Non-systematic portion of an error rate: the part of an error rate detected during control that cannot be applied to other payments to the same beneficiary because its nature is random.

Non-quantifiable errors: errors that do not have direct measurable financial impact on the value of a transaction. These may be errors which concern non-observance of a condition for payment or other compliance issue for example non-respect of deadlines set by a regulation but which does not affect the amount paid.

Normal distribution: a symmetrical distribution in statistics, represented on a graph by a bell curve, in which the class with the highest frequency is at the centre and the classes with the lowest frequency are at each end.

On-the-spot control: an optional control (distinct from both the ex-ante verification and the initiation of an operation) that contributes to an increase in the assurance of the authorising officer by delegation concerning the use of EU funds (for which the Commission is accountable). On the spot control checks the proper implementation of operations already financed (a posteriori - intermediate or final payment) as regards their regularity, conformity and sound financial management. These checks are done on documents and/or on-the-spot and can be selected based on a statistical sample, judgementally by means of a risk analysis or randomly.

Quantifiable errors: errors that affect the eligibility conditions and that have direct measurable impact on the value of the underlying transactions (error rate), for example reimbursement errors resulting from ineligible items included in the cost statements by a beneficiary.

Systematic portion of an error rate: a part of an error rate that can be applied to other payments to the same beneficiary as its underlying causes are of the same nature and they are highly likely to be repeated in other cost statements.

Annex 2: Definition of the dataset on payments:

Budget lines description	Reasons for exclusion
Payments < 20.000 euro	Small grants and payments to natural persons (as experts) were eliminated. Whereas they could be as error prone as bigger payments the financial impact of errors detected therein is overall less material.
Contributions from third countries (payments received from EEA countries)	These amounts are used to finance expenditure related to Framework Programmes in the future, so their inclusion would result in double counting
Budget title 10 – direct research	Direct research is managed by the Joint Research Centre. This spending consists mainly of a large number of small value transactions in a form of direct actions, which are quite distinct from other research spending and require different control strategies.
Administrative expenditure (budget chapters XX 01)	The proportion of administrative expenditure was indirectly included in the calculation of cost of controls by using average costs for the estimates on "Human resources". Administrative expenditure will be analysed separately in the upcoming second wave of Commission's Communication on concrete TRE proposals.
Framework programme 4 and preceding FPs	Payments related to Framework programmes prior to FP5 were not taken into consideration as these programmes are now phasing out.
Media programme	Management of this programme was transferred to a different Directorate General, which falls into another chapter of the ECA's annual report. (To assure the comparability, costs of controlling this programme were not included on the costs side).