

TWINNING CONTRACT

BA 17 IPA ST 01 20



Further Support to the Reform of Statistics System in Bosnia and Herzegovina



MISSION REPORT

Activity 1.3.1 I - Index of Production in Construction IX Component 1.3.1 - Index of Production in Construction

Mission carried out by
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28 August– 01 September 2023

(Including online meetings on 8 and 11 August 2023)

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List of Abbreviations

BHAS	Agency for Statistics of Bosnia and Herzegovina
BiH	Bosnia and Herzegovina
CBBH	Central Bank of Bosnia and Herzegovina
EC	European Commission
EU	European Union
FBiH	Federation of Bosnia and Herzegovina
FIS	Institute for Statistics of Federation of Bosnia and Herzegovina
MS	EU Member State
RSIS	Institute for Statistics of Republika Srpska
RTA	Resident Twinning Adviser
STS	Short Term Statistics
ToR	Terms of Reference

Note by the RTA

The current mission was the eight (8) in the project directly related to the work on the result: implementing a new methodology for the calculation of Index of Production in construction (IPC) in BiH. Namely to use value of production instead of, as currently, hours of worked. In addition, a training in the computer software packages R has been carried out with the aim of making the BC experts (BCE) able to perform the IPC calculations using R. An intensively amount of data analysis has been carried out by both the BCE' and the MS experts. Besides implementing the new methodology now, it is important that the work will be sustainable. I.e. that the method will also be used in the future. In order to try secure that, not only will a methodological document be made, but also will the MS experts insert comments in the R script to explain the steps needed to calculate IPC using the new method.

The remaining steps are described below and in the annex a resume of the work done during the mission in the component so far (1 September 2023) is made.

1. General comments

This mission report was prepared within the EU Twinning Project "Further Support to the Reform of the Statistics System in Bosnia and Herzegovina". It was the ninth mission to be devoted to the Index of Production in Construction Component (IPC) of the Project.

The purposes of the mission were:

- Analysis of data for deflators available from the National Accounts and quarterly CPPI survey
- Building up a time series for the deflator for F41 and F42 using temporal disaggregation
- Calculation of weighting structure by using available SBS data
- Providing new IPC for F41 and F42 for FBiH, RS, BD and BiH using the selection criteria agreed, total value of production and deflation
- Back casting of all the new indices using the previous time series
- Calendar and Seasonal Adjustment of the new IPC series
- Development of Methodological Manual including detailed description of back casting and rebasing process
- Providing updated R script for calculated IPC series, nominal, deflated, including calendar, and seasonally adjusted series.

The consultants would like to express their thanks to all officials and individuals from Bosnia and Herzegovina met for the kind support and valuable information, and which highly facilitated the work of the consultant.

These views and observations stated in this report are those of the consultant and do not necessarily correspond to the views of EU, BHAS, FIS, RSIS, CBBH, Statistics Denmark, Statistics Finland, Statistics Sweden and The Italian National Institute of Statistics.

2. Assessment and results

The latest version of microdata provided by Federation of Bosnia and Herzegovina (entity 1) and Institute for Statistics of Republika Srpska (entity 2) has addressed the issue of missing data. The time span for quarterly STS runs from 2015 to 2021 for entity 1 and from 2014 to 2022 for entity 2. Concerning the missing data, entity 1 has recorded it with a 0 while entity 2 with an NA.

In particular, for each year and firm the pattern of missing data has been identified. Five different cases arise: from 0 (not missing value for all the quarter within the year) to 4 (no information for all the quarters in the year).

The experts have implemented a procedure for the imputation that has been discussed with BC representatives. The method, referred to a hot-deck imputation, has been applied for all the firms with just one quarter missing. The idea is to replace each missing value with an observed response from a similar unit (donor). A firm is eligible as a donor when data for all the four quarters in the year are collected. The selection of the donor is based on a minimum distance criterion, calculated as the difference (absolute value) using the three quarters for which data are available.

The main findings of the imputation procedure are:

- an impact for 2020 and for 2021 for entity 1;
- negligible effect for all the years for entity 2 due to the small number of missing data.

Using the selection criteria discussed in the previous mission the gross index for nominal IPC for the whole construction sector has been calculated.

As further step for final elaboration of the index the characteristics of the deflator (composite price index delivered by the representative of entity 1) have been analysed.

Using the new index based on the value of production and the available deflator a preliminary version of the real IPC has been elaborated and compared with the previous version and with value added for construction sector from National Account.

3. Conclusions and recommendations

To finalise the calculation of IPC, the following steps are required:

- final check of the imputed data for both entities;
- extension of the time span to 2022 for entity 1;
- data for Brcko district to be provided;
- list of holidays for all the entities;
- extension of the imputation method to NACE F41 and F42;
- choice of the composite price index for entity 2;
- preparation of a methodological paper presenting the new IPC;
- discussion with experts from National Account about the results obtained;
- approaching the seasonal adjustment for the new IPC requires the definition of a complete weighting scheme able to consider the disaggregation both for NACE divisions (F41 and F42) and for entities;
- reaching an agreement on the exchange of data between BHAS and entities statistical institutions (format, content of IPC database).

4. What to do before the next mission for BC and MS experts

Action	Deadline	Responsible person
Check Imputed data	Before online mission	FIS, RSIS
Data provision	Before online mission	FIS, RSIS, BHAS
Draft of Methodological paper	Before online mission	MS Experts, BC
Extension of the imputation method	Before online mission	MS Experts
Discussion with National Account	Online mission	
Methodological paper	End of the project	MS Experts, BC
Seasonal Adjustment	Next mission on site	MS Experts, BC

Added by the RTA: Next mission is planned for 11-15 (noon) December in Banja Luka.

Dates for in between online meetings:

18, 25 October, and 8 November at 10:00

If the first day/time slot will become unfeasible for a participant she or he will inform the RTA well before and the next time slot will be chosen.

Annex 1. Terms of Reference for the current mission

Terms of Reference

EU Twinning Project BA 17 IPA ST 01 20

Component 1.3.1. I - Index of Production in Construction (IPC)

28th August – 1st September 2023

(Including online meetings on 8 and 11 August 2023)

On-site meeting

Venue: Agency for Statistics of Bosnia and Herzegovina, Zelenih beretki 26

Room: 1st Floor

Activity 1.3.1.I: Index for Production in Construction IX

1. Mandatory results

IPC produced according to the FRIBS (current EU regulation STS No 1165/98)

New methodology for calculation of Index of Production in Construction / IPC developed (by using value data and CPPI as deflator)

IPC produced and delivered to Eurostat (Non-Adjusted (NSA), Working-Day Adjusted (WDA) and Working-Day and Seasonally Adjusted (SA))

Indicator / Relevant Milestones / Internal deadlines:

Indicators for IPC published and delivered to Eurostat

2. Purpose of the activity

- Analysis of data for deflators available from the National Accounts and quarterly CPPI survey
- Building up a time series for the deflator for F41 and F42 using temporal disaggregation
- Calculation of weighting structure by using available SBS data
- Providing new IPC for F41 and F42 for FBiH, RS, BD and BiH using the selection criteria agreed, total value of production and deflation

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- Back casting of all the new indices using the previous time series
- Calendar and Seasonal Adjustment of the new IPC series
- Development of Methodological Manual including detailed description of back casting and rebasing process
- Providing updated R script for calculated IPC series, nominal and deflated, including calendar and seasonally adjusted series

3. Expected output of the activity

- Data for deflators from the National Accounts and CPPI analysed and discussed
- Time series for deflators built up by using temporal disaggregation
- Weighting structure for calculation of IPC for the level of entities and the state level prepared
- Calculation of IPC for FBiH, RS, BD BiH and BiH levels by using new calculation method and deflators done in R software
- IPC time series for FBiH, RS, BD BiH and BiH back casted
- The list of national calendar of holidays for FBiH, RS, BD BiH defined for the purpose of calendar and seasonal adjustment of quarterly IPC time series
- Updated gross IPC indices for FBiH, RS, BD BiH and BiH levels calendar and seasonally adjusted by using RJDemetra package in R software
- Work on development of methodological document for IPC continued
- Updated R script for calculated IPC series, nominal and deflated, including calendar and seasonally adjusted series provided
- Mission report prepared
- ToR and the list of activities for the next mission defined

Annex 2. Summary of performed work on IPC during the project

Mission A (September 2021 – Online)

Mission purpose:

- Assessment of the current methodology for the calculation of Index of Production in Construction (IPC)
- Establishment of the main steps for the improvement of the current methodology

Result/output of the mission:

The main aims of the mission, carried out from remote due to the Covid restriction, were the discussion on current situation on Index of Production in Construction (IPC) in BiH, on Eurostat requirements for IPC and the development of road map for activities to calculate IPC.

Regarding the methodology at the moment activities for total construction, building and civil engineering works; new construction and reconstruction and maintenance are measured using the quarterly statistical survey on Production in Construction (K KPS GRAĐ-21) paper questionnaires organised in four modules (value of performed construction works – current quarter and cumulative; number of persons employed; hours worked; construction of residential buildings – number).

Data are collected by the entity statistical institutions for the entities and Branch Office of the Agency for Brcko District territory and are available from Q1 2005. A sample of firms is used according to a cut-off method for sample selection (10+ employees and/or 500k BAM value added/turnover, additionally). The size of the sample frame size is approximately 2700 units and the sample size is 438 units for BiH (298 for FBiH, 129 for RS and 11 for Brcko District).

Data are disseminated at 50 days from the reference quarter for Total F, divisions F41 and F42 (NACE Rev.2) as gross, seasonal adjusted (SA) and working day adjusted (WDA) data (using TRAMO-SEATS approach implemented in JDemetra+ v.2.2.3) and gross, SA and WDA IPC indices for Total F level are transmitted to Eurostat using SDMX-ML format together with a metadata report (updated annually).

At the moment hours worked not corrected for productivity coefficient are used for IPC with weights for the aggregation of F41 and F42 given by value of performed works. The actual calculation method has been described (using an excel file) and in the following mission a more in-depth analysis will be carried out.

With the aim to define a road map (including an overall description of coming activities) the main points for the next activities in the component were discussed regarding the current methodology with reference to the criteria for the sample selection (harmonisation between entities even if the cut-off could stay different for them), the introduction of productivity coefficient, the check on the robustness of weights used at the moment, implementation of alternative methods for the IPC calculation to be used as a benchmark, the analysis of the procedure for seasonal adjustment and the introduction eventually of a revision policy.

Mission B (December 2021 – Online)

Mission purpose:

- Check for coherence between Index of Production in Construction (IPC) on other variables of the construction sector
- Analysis of the current methodology for the calculation of Index of Production in Construction (IPC) in terms of weighting scheme and seasonal adjustment

Result/output of the mission:

The main aims of the mission, carried out from remote due to Covid restrictions, were the discussion for the coherence of Index of Production in Construction (IPC) with other variables on construction sector and the analysis of the current methodology for the calculation of Index of Production in Construction (IPC) in terms of index calculation and seasonal adjustment.

Regarding the coherence with other variables, the experts presented some results using data from Eurostat database for Bosnia-Herzegovina, France, Germany, Italy and Spain using Structural Business Statistics (SBS) data on the variables: Number of Enterprises, Value Added, Value of Production and Turnover for the period 2005- 2019 (for BA from 2011) and National Account (NA) data on the variables Value Added Chained Linked and Current Prices in Construction Sector for the period: Q1-2005: Q3-2021. The results on the correlation of these data with IPC data was discussed.

With the aim to define a more in-depth-analysis for Bosnia- Herzegovina, it was agreed that before the next mission some meetings with staff from different departments in BiH (SBS and NA) should be organised to check coherence as well if it would be possible to analyse microdata availability on enterprises.

Regarding the methodology, the current one was presented by BHAS and in order to evaluate the opportunity to compare the results of current IPC with a different methodology, other variables surveyed with the questionnaires such as value of performed work and hours worked will be checked. If possibly also at micro level. A discussion on which type of seasonal adjustment approach (direct vs indirect) was carried out with the aim to deepen the analyses on the next mission.

Mission C (April 2022 – Online)

Mission purpose:

- Discussion with other BiH statistical departments on the availability of statistical information on construction sector
- Assessment of the methodology for IPC calculation

Result/output of the mission:

At first there was a discussion with colleagues from other statistical departments (National Accounts (NA) and Structural Business Statistics (SBS)) regarding the availability of other statistical information for the construction sector about value added and deflators from National Account as well as data on hours worked, value added, number of employees and turnover from SBS statistics. The aim of the discussion was to check for coherence between SBS and STS statistics, the possibility of the use of SBS

data for productivity estimation in the construction sector and data on deflators and cost of construction. This in order to get indicators for deflated value of work done by the STS. The discussion was fruitful, and it was decided to start with the extraction of microdata from SBS and STS on value of performed work and hours worked to explore the robustness of the current methodology for the IPC calculation. Finally the methodology on IPC was investigated regarding the weights used for the base year and the seasonal adjustments between a direct and indirect approach.

Mission D (May 2022 – in Sarajevo)

Mission purpose:

- Assessment on the differences on the microdata collected for STS- respectively SBS purposes
- Exploring a feasible way for a New methodology for the calculation of Index of Production in Construction (IPC) developed by using value of production and CPPI (Commercial Property Price Index) as deflator

Result/output of the mission:

The first main aim of the mission was an in depth analysis of the micro data stemming from STS respectively SBS. The differences was illustrated and the reasons for the findings was discussed. Some explanation might be related to the selection process itself while for some unit a further investigation is required.

Then the difference in the selection process of STS unit along the available quarters was investigated. This point also refers to the methodological approach adopted, as for example to cover the full target population or considering a sample selection. Also, the adoption of a procedure for the estimation of the missing values in a quarter might require further investigation.

The second main point was an exploration of a new methodology based on the quarterly value of production.

Using the selected STS microdata different hypothesis has been elaborated and a comparison with the present IPC has been provided. The main issue concerning the difference in the variability of the method based on the value of production versus the hours worked. This evidence could be referred to a sort of sticky reporting by the firm for this variable.

RTA:

Value of production = gross value of a period's production

Value added = value of production – intermediate production (input in the production process) = GDP contribution

Mission E (December 2022 – in Banja Luka)

Mission purpose:

- Follow up on the actions agreed on at the last mission

Check of the comparison of the data (BC)
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Extending the proposed approach to hours worked (MS)
Check of the selected SBS micro data (BC)
Short description of the methodology used by national accounts to provide the quarterly value added for Construction (BC)

- Detailed STS micro data analyses on hours worked
- Preliminary assessment on the methodology able to manage both the missing data and the panel of the target population
- Comparing the performance of the index based on the hours worked and the one related to the value of production
- Looking at the similarity/dissimilarity of the short-term profile of the indicators at the entity level
- Timeliness of the required data for the methodology based on the deflated value of production and their implication for a revision policy
- Timeliness for the implementation of the new IPC based on the deflated value of production
- Dissemination of IPC within a broader set of STS indicators by a monthly report on BiH economy

The mission agenda was defined as follows:

1. Analysis of coherence between STS, SBS and National Accounts at macro level.
2. Comparison between SBS and STS micro data by using the link to unit and checking for the presence of outliers.
3. Analysis on STS variables on balanced and unbalanced panel data set for 3 years.
4. Presentation of Ms. Roberta De Santis of dissemination of STS indicators for economic analysis.
5. Outline for methodological paper on IPC calculation and construction statistics.
6. Future activities on R training for IPC calculation and seasonal adjustment (RJDemetra).
7. Agenda for the activities for 2023 regarding IPC calculation both from experts and statistician with deadlines.
8. Deflation of value of performed works (F41 quarterly and F42 annual data): temporal disaggregation or constant deflator for the whole year?
9. Backcasting, rebasing, seasonal adjustments and revision policy.

Result/output of the mission:

The MS STE presented an analyse of the coherence of Index of Production in Construction (IPC) using other macro indicators on construction sector. Data were downloaded from Eurostat database for Bosnia-Herzegovina, France, Germany, Italy and Spain using Structural Business Statistics (SBS) data on the variables Number of Enterprises, Value Added, Value of Production and Turnover for the period 2005- 2019 (for BiH from 2011) and National Account (NA) data on the variables Value Added Chained Linked and Current Prices in the Construction Sector for the period from Q1-2005 to Q3-2021.

For all the countries in terms of annual growth rate IPC has the highest correlation with value added from National Account: for BiH the correlation is around 0.7 while for Italy is almost 1. This is, however, due to fact that in Italy the IPC is the main input to measure the value added in the construction sector. In all the countries the IPC correlation with SBS value added is lower.

For BiH, considering the quarterly IPC growth rate, the magnitude of the correlation with value added from National Account (NA) decreases and notably from 2015 it is very low. It would be important to discuss the reasons behind this evidence with some experts from BiH NA departments.

Afterwards, in order to investigate further the differences in IPC measurement between the two BiH entities the MS STE's showed the results of some analysis using microdata from SBS and STS done with an R program code. The code and the output was provided to the BiH representatives.

In particular, using microdata from SBS, the correlation between value of production, cost of raw materials and hours worked was measured for each entity and for each available year. Using the same variables separately for each entity a Cobb-Douglas production function was estimated. The coefficients proved to be different for each year in the time span (entity 1 from 2017 to 2019, entity 2 from 2018 to 2020).

These results suggest that the estimate might be biased by outlier presence and thus the analysis has to be deepened further.

The MS STE's then compared for the two entities, using microdata from STS the hours worked on site, workers on site and value of production, the quarterly growth rates. The result was that the value of production series showed for both entities more volatility.

In order to understand the effects of editing and imputing technique on STS data a panel of firms for both entities and for value of production, hours worked and workers on site was created only for residential building (41). Therefore the sum of each variable was calculated i) using all the observations, ii) removing the observations of firms with at least one missing value, iii) removing the observations of firms with at least one missing values or zero .

The following evidences emerged:

- i) In entity 2 there is less difference due to the effect of missing values;
- ii) In both entities there is similar behaviour for all the variable even if value of production shows higher variability;
- iii) There is presence of seasonality in entity 1 for value of production and hours worked while for entity 2 only after 2020.

The MS STE's presented a proposal to disseminate the IPC statistics also within a monthly report on the BiH economy. The Istat experience of the monthly report on Italian economy was shared and discussed. The expert underlined that adding some economic analysis to the evolution of construction sector indicators within a broader set of short term statistics proved to be more appealing and comprehensible for media and people.

Mission F (January 2023 – in Banja Luka)

Mission purpose:

- R computer software training with focus on IPC and SBS data

Result/output of the mission:

Introduction to the statistical programme R;

R and the Rstudio interface have been demonstrated, introductions have been made to data structures, data management, programming, data exploration and basic statistics plus visualization.

The aim was to give the opportunity to the participants to be able to use the code in R to replicate the analysis on SBS and STS microdata on construction sector shown in the previous missions.

The consultants have prepared slides and R scripts which were presented to the participants as an introduction to programming in R and how to use the extended set of possibilities provided by RStudio.

The topics included:

- The role of R and RStudio;
- Using R help function;
- Types of elements (numerical, character, logical, factor)
- Types of objects (vectors, matrices, data frames, and lists)
- Reading from and writing to data in R-format (RData and RDS) and delimited files (csv and related);
- The apply function and variations (sapply and lapply)
- Data wrangling using the dplyr and tidyr packages
- Visualisation using graphical functions from base R (plot) and introduction to the grammar of graphics with ggplot2 (including maps)
- Basic summary statistics

Mission G (March 2023 – in Sarajevo)

Mission purpose:

- Analysis of prepared micro data from annual SBS survey (2019 – 2021) and STS survey (2019 – 2022); treatment of zero and missing values
- Meeting of MS experts with STS, SBS and NA staff on data quality, differences in IPC results obtained by using value of performed construction works and hours worked
- Detailed analysis and checking of prepared annual and quarterly deflators for construction sector (total construction, building construction and civil engineering works)
- Presentation of completed R code for comparison of micro STS, SBS and NA data for construction sector
- Making a final decision on calculation method for IPC
- Preliminary calculation of IPC for F BiH, RS, BD BiH and BiH levels based on agreed methodology and prepared updated data
- Back-casting of quarterly IPC time series for the period Q1 2006 – Q4 2022
- Preliminary calculation of IPC for F BiH, RS, BD BiH and BiH levels on the new base year 2021

- Preliminary calculation of calendar and seasonal adjustment of IPC for FBiH, RS, BD BiH and BiH levels and discussion of results
- Preparation of the content for the new methodological document for IPC

The main aim of the mission was a detailed analysis of microdata on construction sector on STS and SBS domain in order to:

1. To check for systematic bias between SBS and STS data on hours worked, employees and values of work done and value of production.
2. To compare data on total value of production and hour worked.
3. To learn more about the past to be safe for the future.
4. To create a panel of firm for IPC calculations

Result/output of the mission:

At the beginning of the mission a detailed analysis of the variables sent from entities on the sample of firms in SBS and STS domains was carried out to create the input file for an R code to compare data and compile IPC. Then a meeting with FIS NA department was organised to understand how data on IPC can be used in the compilation of the main aggregates in NA. All the procedures have been described using a production and income approach for the annual GDP and a production approach for quarterly GDP. Mainly financial statements are used for the annual GDP and indicators relevant from STS and administrative data for the quarterly GDP. Given the low volatility of IPC at the moment this indicator is not used in quarterly GDP calculation.

Regarding the comparison between SBS and STS data, the MS STE's presented the R code (that will be delivered as output of the mission). The results was discussed and on this basis, it was decided that in order to arrive at a first IPC compilation, all the values in the record with zeroes should be considered as missing values, a threshold of 10 employees should be used (the same used in the cut-off sample in STS) and value of production in SBS should be the best proxy for the values of work done in STS. Moreover, the deflator for IPC have been delivered by both the entities.

As a final result of the mission the MS STE presented a first approach for the calculation of IPC according to all the points agreed on earlier. In particular, all the criteria chosen for a selection of a subsample of firms have been described in order to arrive the creation of panel. The main criteria were based on zeroes values were removed, employees higher than 9 and ratio between employees in STS and SBS bigger than 0.5. In such way a panel of 163 for entity 1 and 65 firms for entity 2 was created for which the sum of values of work done was deflated to get a first estimation of a growth rate for IPC for the period Q1.2020 - Q4.2021 (Q4.2022 for entity 2).

Mission H (May 2023 – in Sarajevo)

Mission purpose:

- Finalization of micro data analysis for FBiH, RS and Brcko District BiH based on updated STS and SBS data provided for the period from 2015 onwards
- Updating calculation of IPC for FBiH, RS, BD BiH and BiH levels in R software

- Use of deflators for calculation of deflated IPC for FBiH, RS, BD BiH and BiH levels in R software
- Calculation of back-casted quarterly IPC for FBiH, RS, BD BiH and BiH levels for the period Q1 2006 – Q4 2022
- Analysis of national calendar of holidays for the purpose of calendar and seasonal adjustment of IPC time series
- Calculation of calendar and seasonally adjusted IPC indices for FBiH, RS, BD BiH and BiH levels
- Work on the development of a new methodological document for the calculation of IPC
- Discussion on a revision policy for IPC and the dynamic of updating weights for calculation of IPC

Result/output of the mission:

The first part of the mission has been devoted to the organisation of microdata to be used as input in the R code for the IPC calculation. The dimensions are:

1. Domain: SBS and STS;
2. Entity: Federation of Bosnia and Herzegovina (entity 1), Institute for Statistics of Republika Srpska (entity 2) and Brcko district;
3. Time

Data to be used for the deflation was discussed as well. The R code was finalised for the calculation of IPC using nominal value of production stressing the key point: comparing between SBS and STS data, rules for the selection of firm to be included in the IPC calculation (missing values, ratio between STS values of work done and SBS value of production and more than 9 employees). These rules should be updated and validated by the beneficiary on the basis of their experience on microdata.

Mission I (August/September 2023 – in Sarajevo)

See current mission report

Mission J (October/November 2023 – online)

Up coming

Mission K (December 2023 – in Banja Luka)

Up coming

Annex 3. Persons met

BHAS:

Fahir Kanlić, Head of Department for Industry and Construction Statistics
Anita Brković, Senior Advisor for Construction Statistics

FIS:

Nusreta Imamović, Head of Department for Industry, Construction and Energy Statistics (excused due to vacation)
Edina Dulić, Senior Advisor for Construction Statistics

RSIS:

Želimir Radišić, Senior Officer for Construction Statistics
Danica Babić, Senior Officer for Structural Business Statistics

RTA Team:

Niels Madsen, RTA
Larisa Muslimovic, RTAA, Interpretation

Signatures

For the approval of the contents of this report, representatives from BHAS, FIS and RSIS as well as MS experts and the RTA sign here:



Component leader, BHAS



Component leader, FIS



Component leader, RSIS



RTA



MS Expert



MS Expert