

# Digitalisation of construction planning in Poland

Management of procurement and  
construction process in BIM methodology

**Final report**

October 2020



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## Notes

The text **MARKED IN ORANGE** means information which, in the opinion of the authors of this study, is particularly important.



# 1 Introduction

## 1.1 Purpose of the document

This final report was prepared as part of the Project “Digitalisation of the construction planning in Poland” by PwC for the European Commission – DG Reform (fmr. Structural Reform Support Service) under the Specific Contract number SRSS/SC2019/112 dated 22/10/2019 implementing framework contract No SRSS/2018/01/FWC/002-07. The Beneficiary of the project is the Ministry of Economic Development, Labor and Technology of the Republic of Poland (fmr. Ministry of Investment and Economic Development, Ministry of Economic Development), Department of Architecture, Construction and Geodesy.

The document summarises the overall project, the activities and individual deliverables and outcomes of the project. It also summarises the lessons learned in the project for the future projects in this field.

## 1.2 Structure of the document

The final progress report consists of 3 main sections and appendices:

### The Project

The section provides the project objectives, stakeholders’ consultation process, the list of deliverables and their status

### The Result

The section describes the details of the deliverables and recommendations provided in the studies

### The Lessons Learned

The section summarises the key challenges encountered, success factors and lessons learned in the project for future reference in this field

### Appendices

Key project deliverables and stakeholder consultations meeting notes

# 2 The Project

## 2.1 Project objective and structure

The general objective of the project is to support the Ministry of Economic Development, Labor and Technology in increasing the efficiency in the procurement and construction process of the public projects in the field of the cubature buildings in Poland by promoting the BIM (Building Information Modelling) methodology and standardising the BIM tender documents.

The specific objectives of the project are development of document templates for the implementation of cubature investments in the BIM methodology, development of the strategic document "Roadmap" of BIM implementation in public procurement in Poland and preparation of the concept of a digital platform supporting the implementation process.

The achievement of the goals above was preceded by an analysis of the construction market in terms of market preparation for the use of the BIM methodology as well as barriers and expectations related to the implementation; analysis of the ISO19650 standard in terms of recommendations and the possibility of their application in the Polish construction industry and the current legal status in terms of the applicability of this standard.

## 2.2 Stakeholder consultations

One of the key elements of the project was consultations with stakeholders in the construction market. Consultations were conducted in the form of meetings with a discussion part, videoconferences with Q&A session and surveys. Participation in the meetings was not limited, unless the meeting concerned a given stakeholder group. Reports from meetings and survey results were published on an ongoing basis on the ministry website. The purpose of the consultation was:

- obtain information from the market on the preparation for the implementation of investments in the BIM methodology and the expectations of stakeholders regarding the implementation process, in order to define the boundary conditions for the BIM implementation Roadmap and further recommendations,
- discuss the assumptions adopted for key project studies,
- acquire stakeholder input for key project studies,
- inform stakeholders about the course of the project and the planned next steps within its framework,

The table below presents the schedule and subject of consultations.

Table 1. Schedule of stakeholder consultations

No	When	Subject of consultations	Stakeholders	Form
1	28/01/2020	Presentation of the history of BIM implementation in selected EU member states, understanding the market potential and current preparation of stakeholders for the procurement and implementation of projects with BIM requirements, discussion on the recommendations regarding the organisation of the investment process using BIM in Poland	Public investors at the central and local level, private investors, property managers, public institutions	Meeting
2	29/01/2020	ditto	Designers, consultants	Meeting
3	30/01/2020	ditto	Contractors, consultants	Meeting
4	February	Identification of benefits and barriers related to BIM implementation and activities necessary for	Representatives of all stakeholder groups in the	Survey 1

Table 1. Schedule of stakeholder consultations

No	When	Subject of consultations	Stakeholders	Form
	2020	the implementation process, assessment of the boundary conditions for the BIM implementation process	construction industry	
5	04/03/2020	Presentation of the project objectives and signaling the need for cooperation between the PFRn and the Beneficiary in the context of developing BIM document standards for pilot projects of residential housing (the Apartment Plus program) specified in the project tasks	Polish Development Fund - Real Estate (PFRn)	Meeting / videoconference
6	10/03/2020	Discussion of the results of the above-mentioned survey, lectures by experts from selected EU countries on the inclusion of the BIM methodology in public tenders, assumptions to the Roadmap, direction of legislative changes	Representatives of all stakeholder groups in the construction industry	Webinar
7	15/04/2020	Understanding the level of readiness of public institutions for implementation and the level of cooperation between ministries, gathering knowledge, data and proposed solutions for the BIM implementation strategy	Public institutions and investors	Webinar
8	13/05/2020	Assumptions for the concept of the IT BIM platform developed as part of the project in the context of the functionality of the government e-Tender platform	Public Procurement Office	Webinar
9	09/06/2020	The concept of an IT BIM platform supporting the implementation process, presentation of example solutions in selected countries	Representatives of all stakeholder groups in the construction industry	Webinar
10	June/ July 2020	Acquire stakeholders view and input to the document templates drafts for investment management in the BIM methodology	Representatives of all stakeholder groups in the construction industry	Survey 2
11	24/07/2020	Discussion of the results of the above-mentioned survey and analysis of draft templates	Representatives of all stakeholder groups in the construction industry	Webinar
12	01/10/2020	Summary of the project results, presentation of examples of the use of the BIM methodology in public investments in Poland (lectures by public investors)	Representatives of all stakeholder groups in the construction industry	Webinar

According to the meetings initiating the consultation process, the necessary condition for the success of BIM implementation in Poland, indicated by representatives of all stakeholder groups, was the need to coordinate the activities aimed at implementing BIM (action strategy) and the Beneficiary to assume the leadership of these activities. Initially, the need to gain stakeholders trust was clearly noticeable. This was due to the lack of results of government initiatives undertaken so far in the context of BIM implementation and contradictory signals from government units. Moreover, some representatives of public stakeholders pointed to the fact that their participation in the meetings resulted from the interest in the subject of the project, but they were not formally appointed by their organisations to consult the project and provide substantive analysis of the proposed solutions.

An example is the participation in the project of the key stakeholder - the Polish Development Fund - Real Estate (PFRn)<sup>1</sup>. Due to organisational changes that took place in the PFRn in parallel with the commencement of stakeholder consultations (January 2020), it was necessary for the Beneficiary to develop a new memorandum of understanding on bi-lateral cooperation. It was important from the point of view of the subject of the project, which concerned the standards for a pilot project in the affordable housing segment, in which PFRn is the investor (Apartment Plus scheme – *pol.* Mieszkanie Plus). Finally, in May 2020, a MoU was signed on cooperation in the field of advisory and consultation regarding the standards of tender documents for pilot projects in affordable housing and cooperation after the completion of this project. In connection with the above, the project schedule had to be adjusted and project deliverables were submitted later than scheduled. Despite the key role of PFRn for the project and the signed cooperation agreement, the involvement of this stakeholder remained on the same level as others. If the “Apartment Plus” scheme is confirmed as a pilot, greater involvement on the part of the stakeholder will be required.

Stakeholder engagement grew over the course of the consultation process. An example is the process of creating BIM document templates (Deliverable 4c and 5). It was a multi-week process, including consultation through questionnaires and a meeting where the main comments on draft documents and solutions proposed by the stakeholders were discussed. Additionally, the contractor provided a written response to all comments received through the survey, as well as questions and comments sent by e-mail. The result were documents published on the Beneficiary website for use by all stakeholders of the construction industry.

THE TRANSPARENT COURSE OF THE PROJECT CERTAINLY CONTRIBUTED TO THE INCREASE IN STAKEHOLDER CONFIDENCE. BOTH THE RESULTS OF WORK AND THE NEXT STEPS WERE PUBLISHED ON THE MINISTRY WEBSITE ON AN ONGOING BASIS AND COMMUNICATED TO A WIDE AUDIENCE WITH THE SUPPORT OF THE CONTRACTOR.

The element that influenced the course and form of consultations was the state of epidemic emergency introduced in the territory of the Republic of Poland in March 2020 and lasted until the end of stakeholder consultations. Due to the restrictions on public meetings, the form of consultations was changed from meetings at the headquarters of the ministry to webinars with online presentation of materials. The advantage of this form of meetings was a participation of a greater number of stakeholders and time efficiency, the disadvantage - limited possibility of expression, lack of direct contact between meeting participants e.g. networking, exchange of opinions.

## 2.3 Project deliverables

The table below shows the list and status of the deliverables produced by the project.

Table 2. List of project deliverables

No	Title	Status
1	Kick off meeting report	Submitted and endorsed
2	Inception report	Submitted and endorsed
3	Stakeholders consultations 28-30 Jan 2020 – meeting inventory	Submitted and endorsed
4a	Stakeholders consultations – Recommendations and conclusions	Submitted and endorsed
4b	Review of PN-EN ISO19650 series standards including their applicability in the digitalisation of Polish construction industry	Submitted and endorsed
4c	Construction project management in the Building Information Modelling methodology - BIM Draft documents templates	Submitted and endorsed
5	Construction investment management in BIM methodology – BIM final document templates	Submitted and endorsed

<sup>1</sup> PFR Nieruchomości SA, a subsidiary of Polski Fundusz Rozwoju - a group of financial and advisory institutions for entrepreneurs, local authorities and private persons investing in sustainable social and economic development of the country and having a significant impact on the implementation of the commercial pillar of the government program Mieszkanie Plus" [source: Memorandum of Understanding, May 2020]



Table 2. List of project deliverables

No	Title	Status
6	Roadmap for the implementation of the BIM methodology in public procurement	Submitted and endorsed
7	IT platform for BIM – report with recommendations	Submitted and endorsed
8	IT platform for BIM - tender documentation for the public procurement procedure	Submitted and endorsed
9	Final meeting and presentation	Submitted and endorsed
10	Final report	Submitted and endorsed

# 3 The Result

The project assumed the development of a set of documents constituting the basis for further work aimed at the implementation of the BIM methodology in public procurement (Roadmap, BIM documents templates) and the launch of the publicly available IT BIM Platform, which is a response to the key needs of the industry. During project implementation, activities were also initiated, which, in accordance with the recommendations contained in the documents, will be of a continuous nature and will constitute, the basis for further implementation works, i.e.:

- market monitoring through a survey, which will be carried out on an annual basis and its results will be made public by the Beneficiary,
- cooperation with industry representatives within the Working Group,
- establishment of the Steering Committee led by the Ministry of Economic Development, Labor and Technology and composed of representatives of public institutions (selected ministries, Main Office of Construction Supervision, Public Procurement Office, etc),
- development of a detailed strategy of BIM implementation in public procurement.

The project is of a comprehensive nature. Its results meet the most important and most frequently indicated needs by Stakeholders, which are:

- education,
- creating a platform enabling industry integration,
- monitoring the effects of pilot projects implementation,
- supporting public investors in implementing BIM methodology in their organisations,
- clearly defined direction of implementation by indicating further steps and locating them in time.

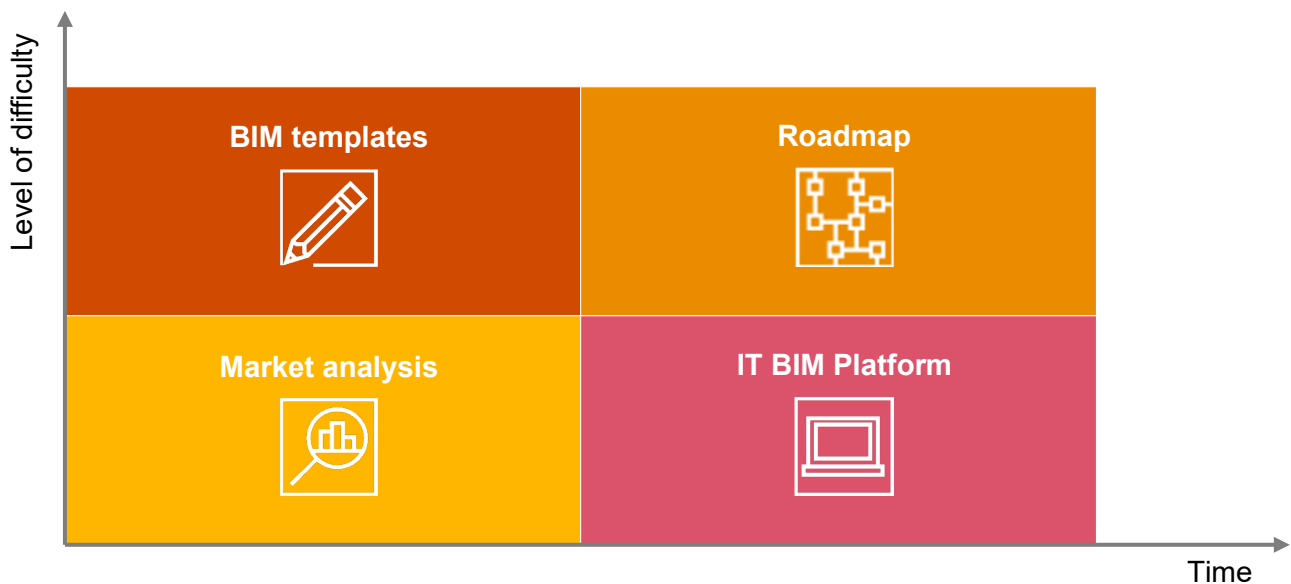


Figure 1. Project Deliverables

## 3.1 Analysis of the construction market and boundary conditions



### The following studies were developed as part of the project

- History of BIM implementation in selected European Union member states - supplementary material for meetings with stakeholders
- Recommendations and conclusions – consultations with stakeholders
- Overview of the PN-EN ISO 19650 series standards, including the possibility of their use in digitalisation of the construction industry in Poland.



### The purpose and scope of the documents

The studies summarise the research and analysis, which constitute the basis for further work on BIM Templates, the Roadmap and the IT BIM Platform. Due to their substantive value, they also constitute a comprehensive compendium of knowledge on the history of BIM implementation in selected European Union countries and the PN-EN ISO 19650 series standards.

The first stage of work on the project was to analyse the history of BIM implementation in selected European Union countries. The following countries were analysed:

- United Kingdom<sup>2</sup>, which was selected due to the most extensive system of procurement and project delivery using the BIM methodology, and since British documents are widely known and used during the implementation of projects using BIM, also in Poland;
- The Czech Republic - selected due to its similarities with Poland in terms of socio-economic conditions and at a similar stage regarding the development of documents and regulations regarding BIM requirements in public tenders;
- Poland, in order to present the already taken market activities and their results.

In the document "The history of BIM implementation in selected European Union Member States - supplementary material for meetings with stakeholders", individual documents that were developed as part of defining the implementation plan, including strategic documents and published standards, were analysed. In addition - the conclusions from the pilot projects and recommendations for further work on the development of a BIM implementation strategy in Poland were presented. The recommendations are described in Item 2 (page 10) of the report entitled "Recommendations and conclusions – consultation with stakeholders".

"The history of BIM implementation in selected European Union member states - supplementary material for meetings with stakeholders" consisted of eight chapters, the content of which is presented in the table below.

Table 3. Content of the supplementary study for stakeholders "History of BIM implementation in selected European Union member states - supplementary material for meetings with stakeholders".

No.	Title	Content description	Page
1	Project context	Project description: assumptions, objectives and products of the individual stages	5
2	Why BIM?	The most frequently cited reasons for implementing BIM indicated in British and Czech literature: economic reasons, low productivity, low level of innovation in the construction sector	70
3	Maturity levels	<ul style="list-style-type: none"> <li>• Indication of methods for determining the maturity levels</li> <li>• Description of the levels in the UK Roadmap with the main assumptions</li> </ul>	11
4	BIM implementation in the Czech Republic	<ul style="list-style-type: none"> <li>• Bottom-up initiatives that have contributed to the decision of state administration to develop a national implementation strategy for BIM</li> <li>• Actions taken by the government to develop a national implementation strategy for BIM</li> </ul>	16

<sup>2</sup> At the time of project procurement and delivery the UK was a member state of the European Union.

Table 3. Content of the supplementary study for stakeholders "History of BIM implementation in selected European Union member states - supplementary material for meetings with stakeholders".

No.	Title	Content description	Page
		<ul style="list-style-type: none"> <li>Assessment of BIM implementation in terms of published reports</li> </ul>	
5	BIM implementation in UK	<ul style="list-style-type: none"> <li>The idea of a "push-pull" strategy, strategic documents indicating further goals for BIM implementation and the digitalisation of the construction industry</li> <li>Brief description of implementation in the constituent countries of the United Kingdom: Scotland, Wales and Northern Ireland</li> <li>Assessment of the level of BIM implementation in the UK</li> </ul>	19
6	BIM documents	<ul style="list-style-type: none"> <li>Content of Czech strategic documents regarding BIM</li> <li>BIM standards: classifications, contents and requirements contained in BIM level 0, 1 and 2 documents (e.g. BS 1192:2007+A2:2016, BS 7000-4:2013, PAS 1192-2:2013, PAS 1192-3:2014, BS 1192-4:2014, PAS 1192-5:2015, PAS 1192-6:2018, RIBA Plan of Work)</li> <li>Organization of proceedings with BIM requirement - legal aspects (discussion of the provisions of BIM protocols in the UK and the Czech Republic, Czech recommendations regarding the organization of proceedings)</li> <li>BIM education in the Czech Republic (BIM manuals, English-Czech BIM dictionary, methodology for secondary vocational schools)</li> </ul>	27
7	Pilot projects	Selected pilot projects implemented in the Czech Republic and the United Kingdom, divided by country, conclusions from the pilot projects	50
8	BIM in Poland	<ul style="list-style-type: none"> <li>Analysis of BIM reports concluded in Poland in 2015-2019</li> <li>Discussion regarding the existing initiatives taken by government authorities and contracting authorities from the public sector.</li> <li>Brief discussion of projects completed according to BIM requirement: statistics regarding the type of works, trends in BIM requirement, criteria for participation in procedures and non-price criteria for evaluation of tenders</li> <li>Bottom-up initiatives: associations, conferences, BIM standardization initiatives in Poland, education activities</li> </ul>	54

Source: "Recommendations and conclusions - consultation with stakeholders" Table 1

The next stage of work included meetings with stakeholders and conducting a survey, the main purpose of which was to:

- determine the boundary conditions for the BIM implementation Roadmap in Poland;
- define the boundary conditions for an BIM IT platform, in particular the scope of IT systems currently used by the construction industry;
- identify the greatest benefits and barriers to BIM implementation at the organisational and national level;
- identify actions that the market considers necessary to make the implementation process effective and efficient (key success factors);
- gather stakeholders' feedback on the recommendations provided in the study "The history of BIM implementation in selected European Union member states - supplementary material for meetings with stakeholders."

Summary of the survey results and preliminary recommendations for the implementation of the principles and standards described in the document "History of BIM implementation in selected European Union member states - supplementary material for meetings with stakeholders" at the stage of developing BIM Templates and the Roadmap are included in the document "Recommendations and conclusions - consultation with stakeholders".

The project also assumed a detailed analysis of the standards of the PN-EN ISO 19650 series, which was included in the document entitled "Overview of the standards of the PN-EN ISO 19650 series, including the possibility of their use in the digitisation of construction in Poland". The study also includes:

- Recommendations on the scope of documents necessary for the implementation of investments using BIM in the construction of cubature and residential construction, considering:
  - previously conducted analyses of the investment implementation system using BIM in the European Union countries (UK, Czech Republic and Poland),
  - stakeholder comments obtained during the consultations carried out in the previous stage,
  - results of a survey carried out in the previous stage.
- Analysis of the possibility of using the indicated documents in the context of Polish law (in particular the Public Procurement Law Act and the Construction Law Act).

## 3.2 Roadmap



### The following documents were developed as part of the study

- Roadmap for the implementation of BIM methodology in public procurement – report
- Roadmap for the implementation of BIM methodology in public procurement – brochure



### The purpose and content of the study

The purpose of the document is to support the Beneficiary in developing an integrated BIM strategy for the construction process in public procurement. In line with the intentions of the Beneficiary, highlighted during the meetings with stakeholders, this document will be the basis for further work to implement the BIM methodology in Poland.

The general goal of the Roadmap implementation is to achieve by 2025 a level close to the currently required British BIM implementation level, but enriched with many additional elements, presented in the document, as well as **RAISING AWARENESS OF ALL PARTIES CONCERNED OF WHAT ISSUES LIE AT THE BOTTOM OF THE BIM METHODOLOGY, THEIR LEGISLATIVE<sup>3</sup>, NORMATIVE<sup>4</sup>, CULTURAL OR SOCIAL BASIS AND HOW AND WHEN THEY CAN BE USED IN THE STRATEGY OF BIM IMPLEMENTATION IN POLAND**. The purpose of the document is to create a professional BIM manual for the construction market.

To enable the development of an optimal strategy for the needs of the Polish market, the approaches to BIM implementation in selected countries around the world and the available information on key activities undertaken in this area in Poland were analysed.

The document contains an extensive analysis of, inter alia, the process of digitalisation of construction in the United Kingdom, activities undertaken in this direction in Spain, the Czech Republic and other European countries such as Estonia, Finland and Germany. The document also includes references to Singapore, which is one of the most advanced Asian countries in terms of BIM adaptation. Based on the above analysis, a table has been prepared (Table 1 in the Roadmap document), which lists the elements recommended for inclusion in the Roadmap for Poland. As part of this task, the existing and relevant strategic documents and initiatives in Poland were also analysed (based on available information).

Table 4. Elements from other countries for the Polish Roadmap.

Source: "Roadmap for the implementation of BIM methodology in public procurement", Table 1

Item	Country	Elements of the strategy implemented in the Roadmap for Poland
1	United Kingdom	Push-pull strategy, high and understandable degree of graphic representation of the Roadmap, initiative to build a digital country model based on related digital twins, focus on open formats in further stages of BIM implementation, public financing of implementation works (government grants), initiation of BIM standardization for ISO standards in PAS and

<sup>3</sup> Legislation concerns documents published as laws and regulations, both by the Polish government, and the European Union

<sup>4</sup> Normative aspects (normalisation) are products of the Polish Normalisation Committee and the international ISO organisation

Table 4. Elements from other countries for the Polish Roadmap.

Source: "Roadmap for the implementation of BIM methodology in public procurement", Table 1

Item	Country	Elements of the strategy implemented in the Roadmap for Poland
		BS standards, basing the Polish road to BIM at the British Level 2, enriched with the use of digital twins, distributed ledger technologies, Lean methodology and the sustainability aspect
2	Spain	Different implementation dates for BIM mandate depending on the type of project
3	Czech Republic	An approach based on the practical use of BIM in pilot projects from the beginning of the implementation process. Establishing a Steering Committee as a body gathering the top-down BIM decision-making in Poland, with the minister for development as a leader and selected advisors, as indicated by Czech experts (based on their experience)
4	Estonia	A comprehensive process of digitalisation of public services, the use of distributed processing technology for data security
5	Finland	A comprehensive process of digitalisation of construction, the use of open formats in data exchange, a high degree of prefabrication in construction
6	Germany	Clearly written BIM implementation strategy based on several stages and early pilot projects, introduction of the concept of convergence to unify the goals of participants in construction process
7	Singapore	Public leadership for the process of BIM implementation, a high degree of design for large-scale fabrication and prefabrication, BIM obligation assigned to industries and types of investments, recommendation of regrouping project costs into early investment phases, motivation of BIM pioneers

Developing a national strategy was necessary because, due to the different market specifics and legal conditions in different countries, solutions that operate in the world with different results cannot be adopted through regulations. The purpose of the document is to outline a clear framework for the implementation of the BIM methodology, so that specific solutions can be used and modified to increase the efficiency of the construction industry in Poland.

The structure of the Roadmap is an open matrix of 9 elements, four of which represent the phases of project procurement and delivery (1-4), and the remaining five (A - E) support them in terms of content. The remaining 3 control factors (legislation, standardisation and financials, including necessary training) are present in each of the other 9 elements. The matrix is not an arbitrary list of items from which you can choose your own set, but the target system. Relying on standards, technology or environmental requirements will not be sufficient when the human perspective is not taken into account in the integrated project processes or the classifications or optimal cybersecurity environment are not developed. The system will function fully only as a complete and integrated whole. (More information on this subject is provided in chapters V and VI of the Roadmap).

	Plan of Work	Macro BIM	Capital phase	Operat- ing phase	
Technology	A1	A2	A3	A4	A
Cyber security	B1	B2	B3	B4	B
Lean	C1	C2	C3	C4	C
Classification, LOG/LOI	D1	D2	D3	D4	D
Ecology	E1	E2	E3	E4	E
	1	2	3	4	

Figure 2. Matrix nodes

Table 5. Elements of the matrix

Item	Project stage / Field	Description
1	Plan of work	It is not an investment phase, but it covers all the elements that will build the BIM ecosystem, including the BIM Strategy for Poland, detailed strategies, e.g. ICT, Polish BIM standards, pilot projects
2	Macro BIM	New pre-capital phase of project implementation (programming and Target Cost analysis). It requires the development of new, cooperative forms of contracts
3	Delivery phase	Design and construction, Risk register, automation, PIM (Project Information Model)
4	Operational phase	Facility Management: COBie, AIM (Asset Information Model), Digital Twins
A	Technology	Push and pull initiatives; Standardisation of information, CDE (Common Data Environment); open formats
B	Cyber security	GDPR; Copy rights, Distributed processing, Reports on cyber security
C	Lean	Integrated Project Team, Agile, Target Value Design; Last Planner® System
D	Classification, LOG/LOI	Building classification, LOD = LOG + LOI
E	Ecology	Sustainable development, Circular Economy, PEDs (Positive Energy Districts)

The matrix assumes an additional stage in the investment process, called Macro BIM<sup>5</sup> (BIM at the investment programming stage), which is to provide investment economic security. This stage does not yet exist in investment processes in Poland, but ultimately it is recommended to introduce it for the benefit of every construction investment, public or private. (More on the Macro BIM phase - chapter 5.2 "Roadmap for the implementation of BIM methodology in public procurement").

The typology of matrix nodes is an open system, just like the matrix itself. The aim of the Roadmap document is not a detailed description of all elements of the entire road to implement BIM in Poland, but rather creating an environment that will facilitate the implementation. The Roadmap lists specific tasks to be implemented within

<sup>5</sup> There are 3 degrees of detail of analysis of a given phenomenon or process: Macro (aimed at the examining of the general structure and relations in a given system), Micro (a detailed analysis of all key attributes and system relations), Meso is an interim type. The Macro BIM discussed here is an approach to BIM from the perspective of a large scale.

individual nodes along with their schedule, allocated responsibilities and necessary financial outlays, as far as it was possible to estimate them.



### **Recommendations provided in the document**

For BIM implementation, it is recommended to adopt success criteria in line with the steps of the implementation plan for Poland, specified in the nodes of the Roadmap matrix. As a tool for monitoring the progress of BIM implementation in the Polish market, status reports are recommended every 2-3 years. Reports should be coordinated by a Steering Committee established under the leadership of the minister in charge of the economy.

Pilot projects are recommended as the first practical step in implementing BIM by public entities. Similar recommendations can be found in the Czech and German strategies (they were described in the first parts of the Roadmap).

The criteria for all significant phases of the investment in combination with the BIM document templates developed under the project should constitute the starting point for measurable phases of implementation. It is recommended to monitor all activities and record the results in order to catalog the operating procedures and avoid errors in subsequent implementation projects.

Practical experience gained in the pilots will also help to improve BIM expertise of all participants of the investment process, including the contracting authorities. Therefore, the full commitment of all parties is required, and as stated in the introduction to PN-EN ISO 19650-1, their close cooperation in order to ensure liquidity and avoid losses in the exchange of information about the asset.

The process of implementing BIM in Poland should be based both on top-down activities (legislative, norms, standardisation and pilot projects) and self-organization of the construction market in the form of bottom-up activities based on cooperation between contracting entities and contractors (work in the Lean methodology, integration of processes, systems and information). Each investment in the BIM methodology is one joint effort by all participants of the investment process.

In order for the modernisation activities for the Polish construction industry to be fully called a "Strategy for Poland" in the Roadmap they have been extended to digitalisation and technological progress of the entire Polish economy, similarly to the British Digital Built Britain, i.e. Digital Built Poland. Only then it would be possible to integrate factors not related to construction but appearing and functioning in the geospatial environment. The driving force behind creating such a strategy for Poland should be the highest levels of state administration, as it is a top-down action ("pull").

In addition to the activities and steps for the implementation of BIM in Poland, as presented in the Roadmap document, it is recommended in the next stages to take additional actions aimed at introducing a comprehensive digitalisation of Polish construction sector, including in particular:

- develop legislation on the Construction Law for conducting digital processes for obtaining the building permit decision (as well as building permit notification processes);
- preparation of local authorities to process the construction documentation in non-paper form, and designers to such form of their delivery, including digital signatures of authors of design studies, systematizing the names and forms of digital documents so that the information about the design intentions is clear and that its content is readable from the names of the files themselves. It will be a preparation for the next evolution of the exchange of design information in the form of digital multidimensional models, also in publicly available open formats, normed by ISO standards; supplying all products and materials on the construction market with identification codes to further improve the digital supply chain. In this way, the combined information will be retained for the entire life cycle of the facilities and will enable smooth management of assets, but also further transfer of digital information about assets to the forms of a digital twin;
- Preparation of the entire market in terms of people education to meet the forthcoming digitalisation tasks (not only in terms of BIM);



- Basing on the Roadmap adopted by the Beneficiary, prepare and develop a detailed BIM implementation strategy for Poland, broken down into scopes, tasks, entities and adequate cost scales;
- Monitor the results of using Macro BIM in pilot projects (if this module is endorsed for implementation).

### 3.3 BIM Templates



#### The following documents were prepared as part of the project deliverable

- Management of the construction investment in the BIM methodology – draft BIM document templates
- Management of the construction investment in the BIM methodology – final BIM document templates
- BIM Lexicon
- Overview of the Exchange Information Requirements (EIR) Template
- Exchange Information Requirements (EIR) Template
- Overview of the BIM Execution Plan (BEP) Template
- BIM Execution Plan (BEP) Template
- Model production and delivery table. Template, overview, example
- BIM Attachment to the Agreement



#### The purpose and content of the study

As part of the project task two types of studies were created:

- **BIM DOCUMENTS TEMPLATES**, the primary goal of which is to support the implementation of public pilot projects in residential construction using the BIM methodology. The task for the project team was at the same time to develop universal document templates for the use of the public and private building construction sector,
- **OVERVIEW OF CONTENTS OF TEMPLATES**, a manual with recommendations developed for ease of use of the templates.

The purpose of the BIM document templates is to support the building and housing construction sector in the implementation of this type of investment with the use of BIM, in particular, in the implementation of Pilot Projects. It is also possible to use the materials in the implementation of other types of cubature investments, but it should be borne in mind that some of the indications or recommendations contained in the templates may not be applicable.

The recipients of the BIM document templates are mainly:

- public contracting authorities implementing residential investments,
- contractors (designers and building works contractors),
- their subcontractors.

As well as:

- private developers delivering residential projects,
- developers implementing other investments in the field of cubature construction,
- contractors (designers and building works contractors),
- their subcontractors.

The BIM document templates can form the basis for the development of similar documents for infrastructure projects. Their adaptation, however, may require greater expenditure than in the case of cubature construction, because they differ from cubature in many respects. Most of the differences result from the specificity of the implementation of linear / infrastructure projects, however, it is possible to use the same or similar mechanisms as in the case of cubature construction.



## Recommendations provided in the document

The recommendations for the PROJECTS<sup>6</sup> have been provided in the study "Construction investment management in BIM methodology - BIM document templates. Report". These are in particular:

- cooperation of entities involved<sup>7</sup> in the implementation of the PROJECT (in accordance with PN-EN ISO 19650-1);
- application of the "Design and Build" project delivery mode;
- because in the most commonly used procurement modes (i.e. open tender and restricted tender) there is no element of negotiation that would allow the implementation of the Macro BIM phase, in particular Target Cost negotiations and activities recommended by the PN-EN ISO 19650-2 standard, i.e. agreeing the provisions of the BEP (BIM Execution Plan) and the mobilisation plan before signing the contract, it is recommended to depart from these modes and award the project through negotiated procedure with publication or competitive dialogue;
- The inclusion of the Macro BIM phase in the Pilot Projects and other construction projects.

The document also indicates that the role of entities using BIM document templates is to properly anchor them in the tender procedure i.e. to ensure that they become binding on the parties. For this purpose, it is recommended to use the provisions of the "BIM Attachment to the contract". It is also recommended that the contractor should include them in the contracts with his subcontractors. The parties may also use other provisions not included in the "BIM Attachment to the contract", if it is dictated by the needs of the PROJECT.

## 3.4 IT BIM Platform



### The following documents were prepared as part of the project deliverable:

- Digital BIM IT platform – Report with recommendations
- Digital BIM IT platform for BIM – Procurement and delivery schedule and budget



### The purpose and content of the study

The document is a technical report on ICT (Information and Communication Technologies) solutions supporting the use of BIM in public procurement.

The report was prepared basing on information obtained from European countries and the domestic market. Due to the intended use of the proposed solutions - for the Polish construction market - domestic conditions legal (primarily the Public Procurement Law Act) and organisational ones - were particularly important. At the same time, the needs of the market and its readiness to effectively use individual IT tools were considered.

The study consists of three parts:

1. Analysis of the current state of ownership and use of ICT tools by the construction industry in European countries and in Poland,
2. Concept of the proposed BIM IT system,
3. Implementation schedule and estimated budget for the BIM Platform (confidential documents due to the future procurement of the contractor).



## Recommendations provided in the document

<sup>6</sup> PROJECT is an investment task, in particular a pilot project, for the implementation of which BIM documents developed under this project will be used.

<sup>7</sup> Entities involved in the implementation of the investment process, in particular: The Contracting Authority, designers, works contractors and their subcontractors.

The voices of representatives of the construction market in Poland raised during stakeholders' consultations (meetings and survey) clearly indicate the need for education in the field of BIM. The answer to this need is to be the IT system planned for launch (BIM Platform).

The BIM platform is a place that presents up-to-date information about the top-down actions taken to promote BIM in Poland and their effects.

In addition, the concept provides for the launch of interactive tools that will directly support BIM-related activities and processes undertaken by stakeholders in the construction market as part of the individual projects.

Development of a BIM Platform that meets the above-mentioned goals is a complex task. Therefore, it needs to be **PROVIDED IN STAGES AND IN COORDINATION WITH OTHER ACTIONS TAKEN FOR THE IMPLEMENTATION OF BIM IN POLAND**. It is recommended that the individual functionalities of the platform form separate modules. Their development and implementation should be correlated in time with the development of BIM and digitalisation of the construction industry in order to create an optimal environment for the ongoing changes.

The report indicates the most important technical assumptions that allow the Platform to function properly, as well as a list of modules, the implementation of which should be spread over time.

### 3.5 Legal considerations

Regulations in the field of public procurement law relating directly to BIM are very general both at the level of EU law<sup>8</sup> and national law<sup>9</sup>. They concern the admissibility of requirements by contracting authorities as to the use of specific electronic tools, such as electronic building data modelling tools in the context of communication between contracting authorities and contractors. Although issues related to BIM are regulated in a very general manner at the legislative level, the legal analysis carried out as part of the project, both at the level of national and EU law, leads to the conclusion that there are no legal restrictions that would prevent the use of BIM in public procurement. Currently, the use of BIM is not obligatory, and, consequently, the use of this methodology depends solely on the Contracting Authority's will to use this tool.

**IN ORDER TO POPULARIZE BIM, AND ABOVE ALL TO PROMOTE THE USE OF BIM IN PUBLIC PROCUREMENT, LEGISLATIVE MEASURES SHOULD BE CONSIDERED AND THE INCLUSION OF BIM AS A PRIORITY WITHIN THE STATE PROCUREMENT POLICY, WHICH WILL DEFINE THE PRIORITY ACTIVITIES OF THE REPUBLIC OF POLAND IN THE AREA OF PUBLIC PROCUREMENT, AS WELL AS THE DESIRED DIRECTION OF THE CONTRACTING AUTHORITY'S ACTIVITIES IN THE FIELD OF AWARDING CONTRACTS.**

The purpose of legal changes should be to prepare for the implementation of BIM by obliging certain categories of Contracting Authorities (first, the government administration) to use BIM for investments with an estimated contract value exceeding EUR 10 million. This obligation should be gradually extended by expanding the group of Contracting Authorities and by reducing the value of contracts, the implementation of which should require the use of BIM. The second group of issues should include establishing the requirements for the application of bid evaluation criteria directly related to BIM, with a minimum weight of such criteria of 20%. The above activities will allow for a wider use of non-price criteria as well as linking the evaluation and selection criteria with the target model in which the investment will be implemented. In order to diversify the criteria related to BIM, the definition of applicable criteria should be considered by promoting good practice, documents templates and possible legislative changes in the scope of regulations concerning non-price criteria for evaluation of bids.

In the long term, the use of BIM will allow to shape the production and procurement preferences of public institutions with an emphasis on innovation, environmental considerations or taking into account the entire life cycle of a facility in the procurement costs, not only the acquisition costs.

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<sup>8</sup> Directive 2014/24 / EU of the European Parliament and of the Council of February 26, 2014 on public procurement, repealing Directive 2004/18 / EC and Directive 2014/25 / EU of the European Parliament and of the Council of February 26, 2014 on the award of procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17 / EC

<sup>9</sup> Act of September 11, 2019 Public Procurement Law (Journal of Laws 2019, item 2019, as amended)

# 4 The Lessons learned and recommendations

During the implementation of the project, experiences were collected that are relevant to use in similar projects or as a continuation of this study (lessons learnt). The key findings are divided into the groups:

## 4.1 Public sector leadership – key success factor

Public sector leadership in BIM implementation process is critical to the success of the project and the credibility of the project leader. This was indicated by stakeholders during consultation meetings and in the survey starting the project. The main task of the public leader should be to develop a regulatory environment that will stimulate the use of BIM in public procurement. Important for the success of the project and further stakeholder involvement is also a clear message regarding the political will of the Beneficiary and informing the market about the next planned steps (e.g. via the ministry website). Moreover, it is recommended to closely monitor the activities of institutions subordinate to the ministry so that information on the implementation process is published in a coordinated manner. For this purpose, it is recommended to prepare a project communication plan as soon as possible.

## 4.2 Inter-ministerial cooperation (internal consultations)

Following the endorsement of the Roadmap by the Beneficiary, as a document constituting the basis for further works on a detailed strategy for the implementation of the BIM methodology in public procurement, the tasks and recommendations of the document should form the basis for the works of the interministerial Steering Committee and the Working Group.

As the first step, it is recommended to establish the terms of cooperation with public stakeholders invited to co-create the implementation strategy and its implementation within the Steering Committee, and to define its terms of reference. As mentioned in section 2.3, stakeholders pointed out that they were not empowered by their organisations to make binding decisions. It is important therefore to empower the representatives of these institutions to cooperate with the Beneficiary in order to obtain their qualitative and substantive input. This is particularly important to:

- develop unified standards for the construction industry in the effective way (currently works related to the BIM methodology are carried out by various institutions and are not coordinated);
- select the pilot projects and monitor the results of these projects in a consistent manner. First, it is recommended to confirm the pilots with a key stakeholder – PFRn;
- develop tools aimed at the widespread use of BIM in public procurement, by including BIM as part of the procurement policy that defines the priority activities of the Republic of Poland in the area of public procurement or the legislative changes in this field;
- improve the coordination of activities currently carried out by various ministries, which will avoid duplication of tasks and optimise the activities undertaken towards the implementation of the BIM methodology;
- increase the involvement of public entities in the implementation process and, consequently – the industry's trust in the project leader (Ministry of Economic Development, Labor and Technology) and other ministries;
- coordinating activities aimed at obtaining technical support and / or financing for the next stages of implementation (e.g. detailed implementation strategy, developing analyzes of the effects of regulation or implementing recommendations using the cost-benefit analysis method, developing BIM templates for the infrastructure or industrial sector, changes in the curriculum at the level of technical secondary schools and technical universities, along with the upgrade of the equipment).

## 4.3 Construction industry stakeholder consultations (external consultations)

Ministerial consultations with construction market stakeholders on the implementation of BIM go back to 2016<sup>10</sup>. As reported at the January 2020 kick-off meetings, stakeholders mostly agree on the need to implement BIM methodology in public procurement. This was also confirmed in survey 1. Further consultations are recommended regarding the implementation and co-creation of the detailed strategy. This should be done in a structured way through establishment of a Working Group composed of representatives of the construction market, academic centers and industry organisations, and being an advisory body to the Steering Committee<sup>11</sup>. The Working Group should have no more than 30 participants and may be divided into thematic and task groups (e.g. legal regulations, standardisation, education, pilot projects). The selection of experts included in the Working Group should be based on the assessment of applications submitted by candidates, where the assessment would mainly be their experience and knowledge of issues related to the implementation of BIM.

An important element of the consultation will be as well the annual survey initiated by the survey 1 carried out under this project. The survey addressed to all construction market stakeholders is crucial from the point of view of updating the Roadmap and working on a detailed strategy. It will be a market monitoring tool and its results will influence the direction and pace of work on the strategy. Until the BIM Platform project is completed, a temporary solution is recommended, e.g. placing a survey for year 2021 on the ministry's website. Likewise, the dissemination of the survey and the analysis of the results should be done on a provisional basis by the ministry or a designated entity.

**BASED ON THE PROJECT EXPERIENCE IT IS WORTH TO EMPHASIS THAT AN OPEN POLICY OF CONDUCTING THE IMPLEMENTATION WORKS WILL BENEFIT BOTH THE CHANGE LEADER AND THE STAKEHOLDERS.**

**THE LEADER WILL GAIN ACCESS TO A GROUP OF HIGH-CLASS SPECIALISTS WHO WANT TO CO-CREATE THE CHANGES AS WELL AS THE TRUST OF THE INDUSTRY. THE STAKEHOLDERS WILL BE INFORMED ON AN ONGOING BASIS ABOUT THE PROJECT PROGRESS, WHICH WILL ALLOW THEM TO PREPARE FOR THE UPCOMING CHANGES AND, IF NECESSARY, CHALLENGE THEM.**

## 4.4 Form of consultations

In internal and external consultations, it is recommended to use a hybrid approach, i.e. physical meetings and webinars. The meeting will be more beneficial from the point of view of the effectiveness of discussions, sharing ideas and working out solutions. The webinar can be used to report the progress of work, to reach large group of stakeholders when necessary and to achieve time efficiency.

During the project the stakeholders pointed to the necessity to publish materials for consultation well in advance. Responding to these signals, the time to respond was extended (e.g. surveys, reports). For future reference, it is recommended to develop a schedule of meetings of the Steering Committee and Working Group along with the schedule of issuing materials for consultation. The recommended time to provide the meeting papers is two weeks.

## 4.5 Roadmap update

As a tool for monitoring the progress of introducing BIM to the Polish public procurement market, it is recommended to prepare periodic reports updating the implementation status (e.g. every 2-3 years). Reports should be coordinated by the Steering Committee with the participation of the Working Group. The reports should include, among others: the composition of the Steering Committee and the Working Group, the results and analysis of the annual construction market survey, updating the implementation schedule, updating the

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<sup>10</sup> In 2016, the Ministry of Infrastructure and Construction undertook activities aimed at identifying the needs, opportunities and challenges related to the implementation of BIM in Polish construction and public procurement law. [source: DG Reform ToR]

<sup>11</sup> Recommended stakeholder participation: Organisations associating designers from the architectural and engineering industries, technical universities, general contractors, BIM associations and consultants, Polish Association of Developers, Polish Association of Construction Employers

matrix nodes and tasks (in terms of the progress of works and adding new ones as needed), objectives of implementation activities for the next reporting period.

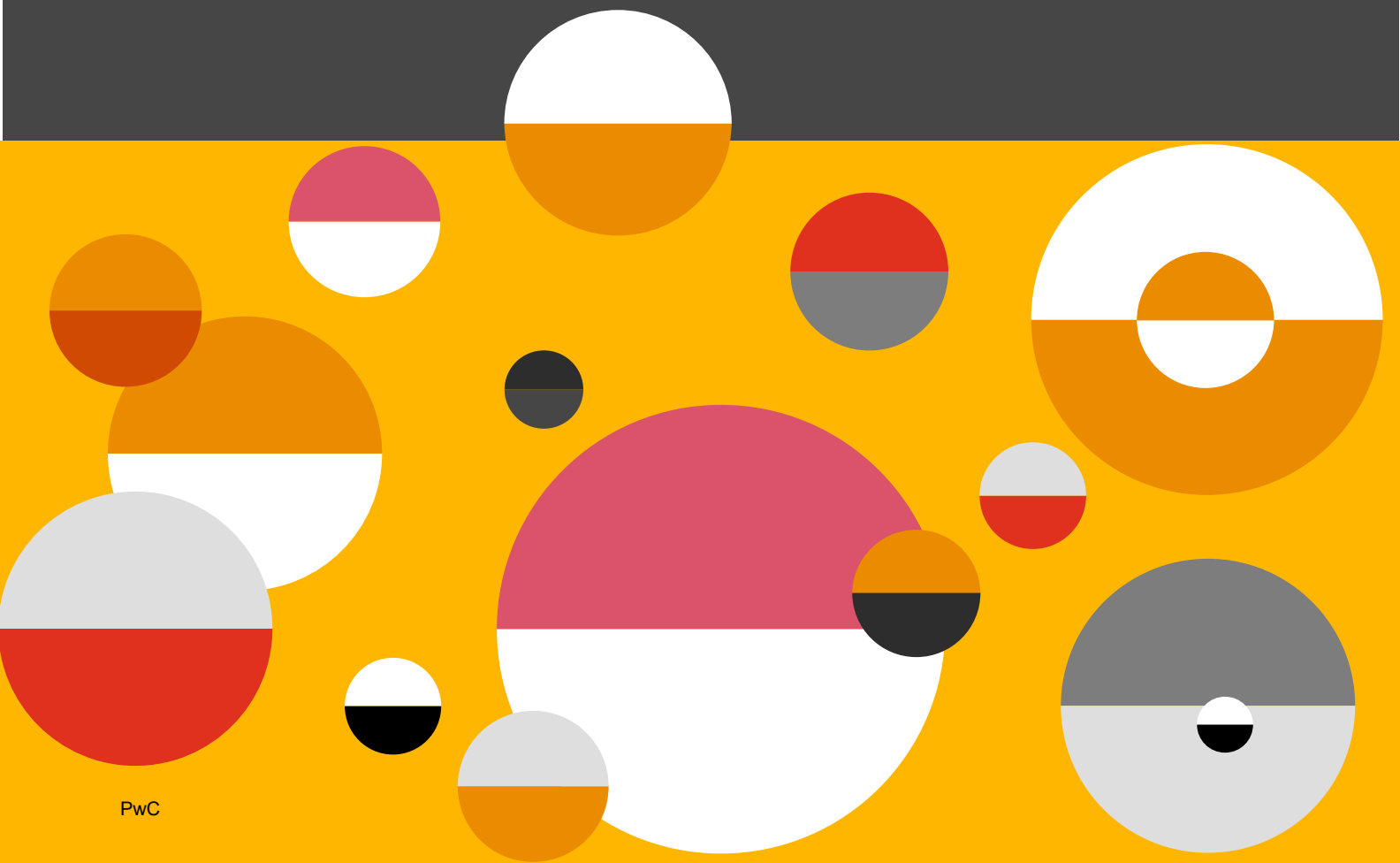
## 4.6 Cooperation in the team Beneficiary – Contractor

Based on the project experience, the cooperation between the Beneficiary and the Contractor has a key impact of the success of the project. It is important that the future contractors have in-depth knowledge of the domestic market, trends and solutions applied internationally. All project parties should monitor activities that have or may have an impact on project course and its result, e.g. initiatives taken by independent organisations, pilot projects, projects and initiatives implemented by ministries and public entities. At the beginning of each project, it is recommended to develop a schedule of activities with the tasks for each entity and monitor it during the project. All project participants need to be aware that one delay entails another, which affects the timeliness of the whole project and reduces the comfort of work of other team members.

## 4.7 Avoid non profit approach

Based on the international lessons learnt (Spain, Czech Republic) the implementation works of the Working Group supporting the Steering Committee should be financed (whether from the Beneficiary's funds or from grants obtained for this purpose). This will ensure the commitment of teams on a constant level and the relevant dynamics of work. As emphasised by the experts - working only based on the non-profit principle in such a responsible task creates the risk of long delays and lack of commitment from the experts. Moreover, there is a risk that top-class specialists will not be interested in cooperation in this format.

# Appendices



Appendix 1. Main project deliverables

Appendix 2. Stakeholder consultations reports



