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InnoRenew CoE Renewable Materials and Healthy Environments Research and Innovation Centre of Excellence

WP 6.1 Advanced materials for cultural heritage storage

Task 1: Database development

Report on the survey of storage conditions of museum objects in Slovenia

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1 ABSTRACT

This report is part of the start-up project's WP6.1 – Advanced Materials for Cultural Heritage Storage, led by the Research Institute of the Institute for the Protection of Cultural Heritage of Slovenia (IPCHS) in cooperation with the University of Primorska (UP), Pulp and Paper Institute (ICP), the National Institute of Public Health (NIJZ), EuroCloud Slovenia and Fraunhofer WKI from April 1, 2018 to March 31, 2021. The start-up project was dedicated to the development of advanced materials for the protection of cultural heritage objects as well as the research regarding their storage and sensorification. The start-up project is one of the eight boosts of the EU's InnoRenew project (H2020 WIDESPREAD-2-Teaming; #739574) coordinated by the University of Primorska.

The report outlines the results of the research focused on storage conditions in Slovene museums and galleries. Data was collected by a structured questionnaire that included questions referring to the organisation of museums' depots as well as collections' storage methods, applications of HVAC (heating, ventilation, and air-conditioning) systems, utilisation of long-term storage packaging and transportation of museum objects. Overall, 78 questions in the Slovene language were prepared. The questionnaire was administered using the OneClickSurvey (EnKlikAnketa) online survey tool. Altogether, 89 Slovene museums were invited to participate in the survey, which ran from September to December 2018, inclusive. Sixty-one museums replied to the questionnaire, and an 80 % response rate was calculated. Data gathered provided a foundation for further work on the start-up project.

2 METHODS

2.1 Questionnaire

The survey questionnaire was developed by the authors of the report, and the draft version reviewed by employees of three different museums. The final version contains 78 questions in five consecutive sections:

A. Organisation of depots and long-term storage of museum objects
B. HVAC systems (heating, ventilation, and air conditioning)
C. Climatic conditions in depots
D. Long-term packaging of museum objects
E. Transportation of museum objects

The questionnaire was administered by the OneClickSurvey (EnKlikAnketa) online survey tool. The estimated duration of the questionnaire was 26 minutes. The survey was prepared and conducted in the Slovene language. For the purposes of the project, it was translated into the English language and can be viewed in Appendix A of this report.

2.2 Sample

Given the small number of museums and galleries in Slovenia, we decided to do a full population study. The sampling frame is based on four lists of Slovene museums:

- Ministry of Culture (56 units)
- Slovene Ethnographic Museum contact list (62 units)
- Bizi.si registry database (50 museums)
- Museums.si website (83 units)

In total, 89 museums were invited to participate (i.e. all units on the Museum.si list, plus four units from the Slovene Ethnographic Museum contact list, and two units from the Ministry of Culture list). Additional reminders were made by e-mail and phone.

3 Results

Data was collected from September to December 2018. In total, 61 museums completed the questionnaire (31 in September; 19 in October; 2 in November and 9 in December). Three museums started to respond but did not completed the survey, 10 refused to participate, two never replied, whereas 13 units were ruled out because they were not museums or were part of another museum that was already included in the survey. Based on that, we calculated the response rate to be 80 %.

The list of the 61 museums that participated is attached to this report (Appendix B) and contains information about the type of museum in relation to its founder (17 national and 44 local) and regional association (36 Western and 25 Eastern). In almost half of the museums, the survey was filled out by the curator (47 %), followed by directors (27 %), while in the others it was completed by conservators-restorers (15 %) or other experts or technicians (Table 1).

Table 1: Working post of the respondent within the museum/gallery (Q3)

n = 61		f	%
1	Director	16	26.7
2	Curator	28	46.7
3	Conservator-restorer	9	15.0
41	Other: technician	2	3.3
42	Other: professional associate	5	8.3

3.1 Organisation of depots and long-term storage of museum objects

Questions in Section A were focused on the organisation of museums' depots and the long-term storage of the objects therein. In this questionnaire, the term "depot" refers to the entire area of a building dedicated to long-term storage of museum objects. The term "depot space" refers to a smaller unit of a depot (such as a room or a hall) that is divided from other spaces by walls and doors.

More than 44 % of the museums have depots in the main museum building as well as at other locations, followed by one-third of the museums (33 %) with depots only at other locations, and almost one-fourth (23 %) with depots only in the main building (Table 2).

Table 2: Where are the depots of your museum located? (Q5)

n = 61		f	%
a	(only) Within the museum building	14	23.0
b	(only) At the location or locations separated from the museum building	20	32.8
a+b	(both)	27	44.3

The 27 museums that selected both options were asked about the location where they store most of the objects (Q6); about half of them selected the first option and around half selected the second option.

The following questions (from Q8 onwards) were related to the depot space in which respondents store most of the items. The depot floor area covers less than 250 m^2 in marginally over half (52 %) of the museums, between 250 and 1000 m^2 in the case of a good third (36 %) of the museums, and over 1000 m^2 with the 12 % of the remaining museums (Table 3).

Table 3: What are the measurements of the whole depot area intended for the storage of museum objects? (Q8)

n = 61		f	%
1	Less than 100 m2	17	27.9
2	From 100 to less than 250 m2	15	24.6
3	From 250 to less than 500 m2	9	14.8
4	From 500 to less than 1000 m2	13	21.3
5	More than 1000 m2	7	11.5

The average height of a depot space is below 2 m in the case of less than 10 % of the museums, between 2 and 3 m in the case of more than half (53 %), and more than 3 m with the rest (38 %) (Table 4).

Table 4: What is the average height of the depot space intended for the storage of museum objects? (Q9)

n = 61		f	%
1	Up to 2 m	6	9.8
2	From 2 to 3 m	32	52.5
3	From 3 m to 4 m	10	16.4
4	Above 4 m	13	21.3

Less than one-quarter of the museums only have one depot space, a good third of them (34 %) 2 to 5 depot spaces, a quarter of the museums (25 %) six to nine depot spaces, and the rest of the museums (18 %) ten or more depot spaces (Table 5). The 14 museums that only have one depot space were asked if the area is somehow divided (Q11). Only two museums answered affirmatively (division is made with a wooden landing in one case and cabinets in the other), while the remaining 12 museums hold their entire inventory in one undivided depot space.

Table 5: Into how many depot spaces (physically separated with walls and doors) is the depot divided? (Q10)

n = 61		f	%
1	1 space	14	23.0
2	2 to 5 spaces	21	34.4
3	6 to 9 spaces	15	24.6
4	10 or more spaces	11	18.0

Forty-seven museums with more than one depot space were asked about the average floor area of depot space. The average area measures less than 50 m^2 in the case of a good third of the museums, 50 to 100 m^2 for 30 % of the museums, and above 100 m^2 for the remaining third (Table 6).

Table 6: What is the average surface of the depot space (in square meters)? (Q12)

n = 46		f	%
1	Less than 50 m2	16	34.8
2	50 to less than 100 m2	14	30.4
3	100 to less than 200 m2	10	21.7
4	200 or more m2	6	13.0

Museums with more than one depot space were also asked about the criteria according to which the objects are stored in different depot spaces (Table 7). Most museums (46 %) put in first place the criteria of "identical/similar material". The criteria of "identical/similar type of objects", which is deemed most important by slightly less than one-quarter (23 %) of the museums, was placed in second or third place by most of the museums. The same goes for the importance of the criteria of identical/similar climatic requirements in which the objects should be stored. The storage according to the curatorial department is the least important criteria for 58 % of the museums.

Table 7: According to which criteria are museum objects stored in the depot spaces? (Q13)

n = 43		1st place	2nd place	3rd place	4th place
a	Identical/similar material	20 45.5 %	13 29.6 %	7 15.9 %	4 9.1 %
b	Identical/similar type of object	10 23.3 %	11 25.6 %	15 34.9 %	7 16.3 %
c	Identical/similar climatic requirements	6 13.6 %	15 34.1 %	16 36.4 %	7 15.9 %
d	According to curatorial department	8 18.6 %	5 11.6 %	5 11.6 %	25 58.1 %

Hereinafter, the museums were asked if they take into account any other criteria regarding objects' storage (Q14). The majority (43 %) answered negatively. Of the remainder, the majority (28 %) pointed out the size of an object. Additional criteria were also the object's conservation state, its importance, sensitivity, handling frequency, its relation to the collection, and storage space availability.

Subsequently, a question for all museums followed regarding the number of objects stored in closed types of storage furniture (e.g., drawers, cabinets), open types of storage furniture (e.g., racks, shelves), and the number of objects stored outside of storage furniture (Table 8). The majority of objects are stored in open furniture systems in the majority of museums (77 %), while only 39 % of the museums store the majority of objects in closed furniture systems. Approximately half of the museums store only a minority of the inventory in closed furniture system. Similarly, only a smaller number of objects is stored

without furniture in the case of 64 % of the museums. Around 20 % of the museums do not even have an object that would be stored outside of the furniture systems. Four museums do not store any objects in closed furniture systems, and only one does not store objects in open furniture systems.

Table 8: What share of museum objects are stored in closed/open furniture systems, and without furniture? (Q15)

n = 61		None	Smaller no.	Larger no.
a	Closed furniture systems (drawers, cabinets, chambers, etc.) (n = 61)	4 6.6 %	33 54.1 %	24 39.3 %
b	Open furniture systems (open shelving systems, art racks, etc.) (n = 61)	1 1.6 %	13 21.3 %	47 77.1 %
c	Without furniture (n = 61)	12 19.7 %	39 63.9 %	10 16.4 %

The museums were also asked about the material properties of open/closed furniture systems installed in the depots (Table 9). Amongst closed furniture systems, the museums most often own metal furniture treated with protective coatings (56 % of the museums), half of the museums (51 %) are also accommodated with powder-coated metal furniture, manufactured by specialized manufacturers according to museum standards. Used in 38 % of the museums, the third most common furniture of the closed type is made of chipboards. The same order is evident for the utilisation of open furniture systems: most common is metal furniture treated with protective coatings (53 % of the museums), followed by powder-coated metal furniture, manufactured by specialized manufacturers according to museum standards (41 % of the museums), and furniture made of chipboards (38 %).

Table 9: From which materials are your closed/open furniture systems made of? (Q16, Q19)

		Closed (n = 57)	Open (n = 60)
a	Powder-coated metal furniture, manufactured by spec. manufacturers according to standards for mus. items	29 50.9 %	25 41.0 %
b	Furniture made of metal, processed with protective coatings	32 56.1 %	32 52.5 %
c	Furniture made of metal, not processed with protective coatings	3 5.3 %	4 6.6 %
d	Solid wood furniture processed with protective coatings	19 33.3 %	16 26.2 %
e	Furniture made of solid wood	15 26.3 %	17 27.9 %
f	Furniture made of chipboard	26 45.6 %	23 37.7 %
g	Furniture made of OSB boards	7 12.3 %	7 11.5 %
h	Furniture made of plastic	1 1.8 %	1 1.6 %

An open-ended question was posed in relation to the types of objects that museums usually keep in a specific type of furniture (closed or open) or without furniture (Table 10). The answers were grouped into 46 categories of museum objects, and the categories were further sorted into seven main classes.

In closed furniture systems, most of the museums (77 %) store objects made from organic materials, particularly works on paper, that are stored in closed furniture systems by 31 museums. The second most commonly stored objects in closed types of furniture are those related to a specific type of collection (in the case of 65 % of the museums), notably items that apply to ethnographic collections, which are stored in closed furniture systems by 12 museums. Other classes and categories of museum items were entered by less than half of the respondents. Foremost is the class of items of a specific size (46 %) where objects of smaller dimensions prevail, followed by artworks (36 %), sensitive items (34 %) and object made of inorganic materials (30 %), mostly metals. Only two museums communicated storage of less sensitive items in closed types of furniture, primarily objects with some sort of physical or chemical protective system or objects less prone to climatic factors.

In connection with open furniture systems, the objects made of organic materials prevail as well (63 %). The majority of items stored in open types of furniture are those belonging to the class of specific size (78 %), namely of larger dimensions in the case of 36 museums.

Table 10: Which types of objects are usually stored in closed/open furniture systems or outside the furniture system? (Q17, Q20, Q22)

		Q17. Closed fur. systems (n = 57)		Q20. Open fur. systems (n = 56)		Q22. Outside f. systems (n = 49)	
20	Objects of specific size	26	45.6 %	28	50.0 %	38	77.6 %
30	Inorganic materials	17	29.8 %	32	57.1 %	16	32.7 %
40	Organic materials	44	77.2 %	35	62.5 %	12	24.5 %
50	Sensitive objects	19	33.3 %	5	8.9 %	3	6.1 %
60	Less sensitive objects	2	3.5 %	14	25.0 %	3	6.1 %
70	Objects related to specific collection type	37	64.9 %	27	48.2 %	23	46.9 %
80	Artworks	20	35.1 %	24	42.8 %	14	28.6 %
100	Majority of objects	2	3.5 %	2	3.6 %	0	0.0 %

Further on, the respondents replied to the question of how many objects are exposed to the listed environmental factors (e.g., dust, light radiation) in connection to the type of furniture (open or closed) they are stored in (Table 11). Museums responded that more items are exposed to all listed environmental factors in open furniture systems, especially to the accumulation of dust (61 %). In comparison, the accumulation of dust in closed furniture systems is considerably less common (11 %). The second and the third most common factors the objects are exposed to in open as well as closed furniture systems are larger fluctuations of temperature and relative humidity, with a somewhat higher percentage of exposure in the case of open furniture systems (38 % regarding relative humidity and 46 %

regarding temperature in comparison to 30 % in both cases in closed furniture systems). In closed furniture systems, both factors (larger fluctuations of temperature and relative humidity) prevail before others listed. According to the respondents, the least amount of museum items is exposed to gaseous pollutants, none in the case of 92 % of museums in closed types of furniture, and none in open furniture systems in 80 % of museums.

Table 11: How many objects currently stored in closed/open furniture systems are exposed to the following environmental factors? (Q18, Q21)

		Q18. Closed furn. syst. (n=56)			Q21. Open furn. syst. (n=60)		
		No objects	Smaller number	Larger number	No objects	Smaller number	Larger number
a	Dust	22 39.3 %	18 50.0 %	6 10.7 %	3 5.1 %	20 33.9 %	36 61.0 %
b	Light radiation	37 66.1 %	17 30.4 %	2 3.6 %	19 32.8 %	30 51.7 %	9 15.5 %
c	Larger relative humidity fluctuations	20 35.7 %	19 33.9 %	7 30.4 %	14 24.1 %	22 37.9 %	22 37.9 %
d	Larger temperature changes	17 30.4 %	22 39.3 %	17 30.4 %	13 22.0 %	19 32.2 %	27 45.8 %
e	Microbial infection (moulds etc.)	31 57.4 %	20 37.0 %	3 5.6 %	25 47.2 %	22 41.5 %	6 11.3 %
f	Insect infestation	38 70.4 %	13 24.1 %	3 5.6 %	25 44.6 %	21 37.5 %	10 17.9 %
g	Rodent infestation	47 87.0 %	5 9.3 %	2 3.7 %	43 78.2 %	8 14.6 %	4 7.3 %
h	Gaseous pollutants	48 92.3 %	3 5.8 %	1 1.9 %	41 80.4 %	5 9.8 %	5 9.8 %
i	Influences of f. materials in/on which obj. are stored	32 64.0 %	13 26.0 %	5 10.0 %	25 48.1 %	19 36.5 %	8 15.4 %
j	Influences of other mus. items stored next to them	31 60.8 %	17 33.3 %	3 5.9 %	22 39.3 %	25 44.6 %	9 16.1 %

The next questions were about the inspection of museum items, specifically, which types of objects are inspected most frequently (Q23) and how often are they inspected (Q24) (Table 12). According to the answers, only four museums (7 %) inspect the objects once per week; therefore, we merged their responses with the ones given from those 17 museums (28 %) that inspect the objects at least once per month. Together, they represent a good third of the museums. We also coupled the categories “at least once a year”, which was chosen by 33 museums (54 %), and “less frequently”, chosen by seven museums (11 %), which collectively stand for two-thirds of all the respondents.

Amongst the items that are inspected most often, the majority pointed out objects made of organic materials (74 %). These items are inspected at least once per month in the case of 60 % of museums.

Lagging behind with 26 % of respondents are artworks, although they tend to be inspected at least once per month in the majority of the museums (81 %) that chose this category. A high percentage of at least once-per-month inspected items shows for inorganic materials, although the latter was stated only by less than 20 % of respondents. A slightly greater number of the museums (21 %) indicated objects related to a specific collection type; however, these items are usually examined at least once per year or less often (62 %). Sensitive and less sensitive objects are inspected less frequently (10 % of the museums mentioned the former and 2 % mentioned the latter). The size of an object has not been chosen by any of the museums responding to the questionnaire.

The inspection of museum objects is most frequently done by museum curators (in the case of 75 % of the museums), followed by conservators-restorers (in the case of 43 % of the museums) (Q25).

Table 12: Which museum objects, stored in the depot, are most frequently inspected? (Q23, Q24)

		Q23. Most frequently inspected objects (n = 61)	Q24. How often are these objects inspected?	
			At least once per month (n = 21)	Once per year or less frequently (n = 40)
20	Objects of specific size	0 0.0 %	0 0.0 %	0 0.0 %
30	Inorganic materials	12 19.7 %	8 66.7 %	4 34.7 %
40	Organic materials	45 73.8 %	27 60.0 %	18 40.0 %
50	Sensitive objects	6 9.8 %	2 33.3 %	4 66.7 %
60	Less sensitive objects	1 1.6 %	0 0.0 %	1 100 %
70	Objects related to specific collection t.	13 21.3 %	5 38.5 %	8 61.5 %
80	Artworks	16 26.2 %	13 81.3 %	3 18.8 %

Respondents were also asked if there are any objects that are never or extremely rarely inspected (Q26). Only 38 museums (62 %) answered in the negative. The rest of the 23 (38 %) were additionally questioned about the type of such objects (Table 13). Most museums (9) named the objects related to specific collections, namely archaeological collections (3 museums) and theatrical objects (2 museums); audio-, video- and film-related material, ethnographic collections, geological collections and technical items were mentioned each per one of the remaining museums. The second most common items that are rarely inspected are inorganic materials (7 museums), such as objects made of metal (4), stone (3), ceramics (2) and glass (1), and objects of specific (mostly larger) size (6 museums) or stored at specific (mostly not easily accessible) locations (6 museums).

Table 13: Which objects are never or extremely rarely inspected? (Q27)

n = 23		f	%
10	Objects stored at specific location	6	26.1
20	Objects of specific size	6	26.1
30	Inorganic materials	7	30.4
40	Organic materials	5	21.7
50	Sensitive objects	1	4.3
60	Less sensitive objects	4	17.4
70	Objects related to specific collection type	9	34.8
80	Artworks	4	17.4

3.2 HVAC systems (HEATING, VENTILATION AND AIR-CONDITIONING)

Section B addressed the applications of HVAC (heating, ventilation and air-conditioning) systems in museum depots. The first in this series of questions (Q29) asked the respondents whether the depot spaces are connected to such a system. The majority (64 %) of museums answered that none of the depot spaces is connected to the HVAC system, seven museums that the minority are connected, eight museums stated that most of the depots are connected to the HVAC system, and only seven Slovene museums were able to answer affirmatively for all the depot spaces (Table 14).

Table 14: Are the depot spaces connected to the HVAC system? (Q29)

n = 61		f	%
1	Yes, all depot spaces	7	11.5
2	Most depot spaces	8	13.1
3	Minority of depot spaces	7	11.5
4	None of the depot spaces	39	63.9

Out of 22 museums with depot spaces coupled (partially or entirely) to HVAC systems, the system is shared between the depot and the exhibition area in the case of seven museums, while 15 museums installed separate systems for the areas in question (Q30). The latter museums were asked whether different climatic conditions can be set for each depot space (Q31). Accordingly, six museums answered that a separate setting isn't possible for any of the depot spaces since they are all connected to the same system; three museums replied affirmatively for all depot spaces, and the remaining six only for some depot spaces. The latter six museums also mentioned an approximate share of depot spaces that permit individual settings — two museums stated half of all the depot spaces, one-quarter of spaces was mentioned by one museum, and one-fifth by another one.

To the 15 museums with an individual depot HVAC system, another question was posed. Namely, whether they store only objects with similar requirements regarding climatic conditions in depot spaces

connected to the same HVAC system, or are there also objects that should be stored in a different environment (Q32). Four museums have not answered the question, six replied that in such spaces they only store objects with similar climatic conditions' requirements, whereas five museums stated that items with different climatic requirements are held in such (improper) conditions as well. The latter also gave an approximate percentage of such items: one museum specified 8 % of items (mostly photographic negatives) and two museums specified 10 % of items.

3.3 Climatic conditions in depots

Section C covered the topic of climatic conditions in depot spaces. First, we raised the question regarding the monitoring of the environmental factors in depot spaces (Table 15). Over one-half of the museums monitor relative humidity (53 % of the museums) and temperature (54 %) in all the depot spaces. The next most often monitored environmental factors are biological pests (41 % of museums) and visible light radiation (25 %). The least monitored are gaseous pollutants, which 92 % of the museums do not monitor in any of the depot spaces, followed by UV-light radiation (not monitored by 86 % of the museums) and particulate pollutants (not monitored by 84 % of the museums). In connection with climatic factors they monitor, the museums were also asked about whether or not they conduct annual data recording (Q35). Most museums keep annual records of relative humidity (62 % of the museums) and temperature measurements (64 %); a good fifth also records biological pests' activity (21 % of the museums), whereas for other climatic factors, logs of some kind are kept by less than 10 % of museums. Under the option "other", two museums stated "fire protection monitoring" and one museum stated "human factor".

Table 15: Which environmental factors do you monitor in all depot spaces, which only in some depot spaces and which in none of the depot spaces? (Q34)

		Q34. Monitoring of environmental factors (n=61)			Q35a. Keeping annual record (n = all + some spaces)
		In all depot spaces	Only in some depot spaces	None of the depot spaces	
a	Relative humidity	32 52.5 %	20 32.8 %	9 14.8 %	38 62.3 %
b	Temperature	33 54.1 %	19 31.2 %	9 14.8 %	39 63.9 %
c	Visible light	15 24.6 %	7 11.5 %	39 63.9 %	5 8.2 %
d	UV light	3 4.9 %	4 6.6 %	54 88.5 %	2 3.3 %
e	Particulate pollutants	6 9.8 %	4 6.6 %	51 83.6 %	1 1.6 %
f	Gaseous pollutants	3 4.9 %	2 3.3 %	56 91.8 %	0 0.0 %

(continuation of Table 15)		In all depot spaces	Only in some depot spaces	None of the depot spaces	Keeping annual record
g	Biological pests	25 41.0 %	8 13.1 %	28 45.9 %	13 21.3 %
h	Other	12 19.7 %	0 0.0 %	49 80.3 %	1 1.6 %

Additionally, we wanted to know which types of sensors, tools and techniques museums use for monitoring specific environmental factors (Q35). In approximately half of the answers, we were able to establish the utilisation of digital instruments for humidity (46 % of the museums) and temperature measurements (50 %). Most of them listed Telehum instruments and some instruments of other trademarks. A small percentage of museums still uses analogue means of measurement. Many answers were too general, and therefore, we were not able to categorise them; some museums did not answer the question.

In the case of monitoring visible light radiation, six museums replied they do not use any tool for monitoring, four stated visual inspections, three digital measurements (instruments not specified), whereas the rest of the answers was too general to categorise, and some did not respond. Regarding UV-light radiation, five museums answered they do not use any tools, and two didn't respond.

In the case of particulate pollutants, four museums stated monitoring but without any use of monitoring equipment, and three mentioned visual inspection. In the following question (Q36), none of the museums chose monitoring of PM10 in PM2,5 particles, although they stated monitoring of particulate pollutants in the previous question. Regarding gaseous pollutants, three museums do not use any tool for their monitoring, one reply was not possible to categorise, and one museum chose not to answer. In the following question (Q37), which read "which gaseous pollutants do you monitor", one museum chose acetic acid and one wrote "smoke" under the reply option "other". Other museums, which were said to monitor gaseous pollutants in the previous question, did not reply.

In the case of pests' activity monitoring, 12 museums rely on visual inspection, 10 museum traps, four museums do not use any tools, and the rest gave too general answers to be categorised or they did not reply.

Further on, the museums were asked about the setpoints of climatic conditions (temperature and relative humidity) in depot spaces containing mixed collections, established for summertime as well as wintertime, and about possible deviations from the setpoints (Q38). The set value for relative humidity for wintertime as well as summertime in most of the museums is 50 %, although with minor deviation tolerance in wintertime (5 % deviation) compared to summertime (10 % deviation). In the summertime, the temperature in most of the museums is set to 20°C, and some museums maintain this value over the wintertime as well, although many lower it to 15°C. Temperature deviation in many museums is ±2°C during wintertime as well as summertime, although slightly more dispersed in the latter case.

The respondents were also asked about the guidelines they follow concerning the settings of climatic conditions (Q39). Out of 38 respondents, the majority (79 %) ticked off the Official Gazette of the Republic of Slovenia, No. 47/12 (Rules on the Preservation and Storage of National Treasures and Museum Material, on the Entry in the Museum Register and on Granting the Authorisation for Carrying out the National Public Service of Museums). Many museums also set the values according to their past experiences (56 % of the museums), 20 % of the museums follow recommended values in literature (20 % of museums) or published international standards (7 %). Regarding the latter, respondents stated standards proposed by organisations such as ISO, IFLA and ICOM. Regarding the recommended values in the literature, four museums named the Manual for the Care of Cultural Heritage Objects edited by A. Motnikar. Option "other" was chosen by five of the museums; three stated that they are not able to set values or cannot provide appropriate conditions, one respondent tries considering devices' abilities, and another respondent the experiences of other museums and conservators.

At the end of Section C, we asked respondents to evaluate depot conditions of their museums (Q40) (Table 16), and the majority chose the answer that certain problems occur in specific annual periods (59 % of the respondents), one-quarter (26 %) replied they maintain stable conditions throughout the year, and the remainder (15 %) say they have greater issues maintaining stable conditions throughout the year.

Table 16: What is your assessment of the state of the climatic conditions in the depots? (Q40)

n = 61		f	%
1	We maintain stable conditions throughout the year	16	26.2
2	Certain problems occur in some periods of the year	36	59.0
3	Problems with maintaining a stable situation throughout the whole year	9	14.8

3.4 Long-term packaging of museum objects

Section D of the questionnaire involved questions regarding the packaging of museum objects while stored in a depot. First, museums were asked which types of packaging (according to the materials and forms of packaging) they currently use for prolonged storage of museum objects. Respondents were offered eight categories and an option "other" (Table 17) and could choose several possible answers.

The most used types of packaging are boxes, ticked off by 84 % of the respondents, followed by paper (71 %) and protective folders (56 %). Less than half of the respondents chose the rest of the packaging possibilities such as bags (selected by 38 % of the museums), films and foils (38 %), boards, base plates and foams (31 %), textiles and fabrics (30 %), and fillers (13 %). Five museums stated that they use none of the listed packaging types. Ten museums gave information for other types of packaging under option "other"; however, nine of them stated answers that belong to one of the already given categories, while only one museum specified a category that was not included in the multi-choice question, namely, glass containers of unspecified form.

Table 17: Which types of packaging material for long-term packaging of museum objects do you currently use? (Q42)

n = 61		f	%
100	Paper	43	70.5
200	Bags	23	37.7
300	Boxes	51	83.6
400	Boards/base plates/foams	19	31.2
500	Textiles/fabrics	18	29.5
600	Films/foils	23	37.7
700	Protective folders	34	55.7
800	Fillers	8	13.1
900	Other	10	16.4
96	Currently, we do not use any materials	5	8.2

For every selected category, a sub-question opened that enquired about more detailed information about the material. The majority of those who choose paper (Q43) employ acid-free paper types (38 museums). Eight of them further specified they use buffered acid-free paper, while six chose unbuffered types (Q44); the rest did not know the answer or did not answer the question. The second most common answer was “standard paper”, chosen by 14 respondents, followed by waxed paper (7 respondents), absorbent paper (3), and newspaper (2). Silicone paper seems not to be employed by any of the museums.

Among bags (Q45), PVC bags still prevail (13 museums), followed by polyethylene or polypropylene bags (10 museums), paper (8) and waxed paper bags (4), while none of the museums ticked off absorbent paper bags. Within the option “other”, two museums mentioned bags made of acid-free paper, and one museum bags made of fabric.

Two-thirds of the museums (41 museums) employ cardboard boxes for the long-term packaging of museum objects. Within the category of boxes (Q46), many museums also use wooden boxes and crates (25 museums) and paperboard boxes (23), while metal and polyethylene or polypropylene boxes are used to a lesser extent (used by 14 and 11 museums, respectively). Within the option “other”, four respondents specified boxes made of acid-free cardboard or paperboard, while one of the museums stated the use of specially made boxes for archaeological artefacts, although without naming the material properties.

Regarding boards, base plates and foams (Q47), most museums use standard (14 museums) or acid-free cardboards (12 museums), followed by polyethylene or polypropylene materials (9 museums), polyethylene bubble wraps (9 museums), cardboards (4), chipboards (4) and polyurethane materials (2). OSB boards were not chosen by any of the museums, and none of them proposed other possibilities.

A synthetic nonwoven textile, Tyvek, was the most ticked off answer in the category of textiles and fabrics (Q48), chosen by nine museums. The second most used textiles were proven to be Vrteks and unbleached cotton, both in use by seven museums. Unbleached linen, bleached cotton and unbleached wool are each utilised by one museum only. Silk, bleached linen and bleached wool seem not to be used by respondents. Under the category "other", two museums wrote they use felt textile.

In the category of films and foils, museums mostly use polyethylene bubble wraps (14 museums) or standard polyethylene foils (11). PVC and polyester foil Melinex are utilised by seven museums, while only two respondents selected cellophane and only two museums chose PET foil Mylar or Hostaphan foil. One of the museums provided information on the use of protective bags made by the Ergard company, although without defining its material properties. Under the category "protective folders" (Q50), two-thirds of the museums employ those made of polyethylene or polypropylene (20 museums), while the second most common are those from PVC (12 museums); only three museums use polyester protective folders. Under the option "other", acid-free material and a paper of unspecified type were mentioned twice each.

Polystyrene and polyethylene foams and packing peanuts were ticked off by four museums each, under the fitting category (Q51). Synthetic cotton wool, bleached cotton wool and biodegradable packing peanuts were mentioned by one museum each. None of the respondents chose unbleached cotton wool and foams or packing peanuts made of polyurethane.

The 23 museums that use bags and the 51 museums that use boxes were also asked whether they seal the packaging (Table 18). More than half of the museums never seal the items into the packaging bags (Q52), while two-thirds of the museums never close the boxes (Q53).

Table 18: Do you seal/close the bags/boxes in which you store museum objects? (Q52, Q53)

		Bags (n = 23)		Boxes (n = 51)	
		f	%	f	%
1	Always/in most cases	2	8.7	1	2.0
2	Only for some objects	8	34.8	16	31.3
3	Never	13	56.5	34	66.7

Ten museums that seal museum objects within the packaging bags were asked to explain which types of objects are stored in such a way (Q54). Five museums declared for an object made of specific materials, in particular metal objects (3 museums), wood (1 museum) and stone (1 museum), while two museums mentioned objects sensitive to specific environmental factors, of which two museums stated humidity, and one museum stated temperature and insects, also. One museum stated archaeological artefacts under the category "other".

Storage of certain items in closed boxes was defined by 17 museums. In reply to question Q55, which objects museums usually seal/close within the boxes, 11 respondents chose objects made of specific

materials and eight respondents objects sensitive to specific environmental factors. Under the "other" category, one museum answered that such decisions are dependent on the individual custodian, while another museum stated "floods" and "fire". Out of 11 museums that ticked off the "specific material" category, metal objects and objects of biological collections were each chosen by three museums, ceramic objects and works on paper each by two museums, while other types of objects were each selected by one museum. Within the category of objects sensitive to environmental factors, four museums pointed out those susceptible to moisture, two museums those in danger of insects' attack, and two museums each stated either objects prone to dust accumulation or in danger of mechanical factors.

Respondents were also asked whether any problems occur in sealed/closed packaging systems, and (in case of affirmative responses) what types of sealed/closed packaging are causing problems (Q56). Two museums responded in the negative, one museum mentioned the possibility of too low relative humidity due to central heating. None of the museums specified the type of packaging.

A similar question was asked regarding problems with open packaging systems (Q57). The question was asked to 23 respondents who stated they seal packaging bags and/or boxes only in certain cases. The answers indicate that eight museums do not have any problems, seven museums stated issues with climatic conditions, four museums micro-organisms infection or pest infestation, three stated dust accumulation problems; particulate pollution and material deterioration were mentioned by one museum each. Regarding materials, organic types, such as wooden objects (3), works on paper (2) and leather (1), were indicated most frequently (6 museums altogether). Two museums listed inorganic objects (metal by one and stone by the other), two museums objects of biological collections, and one stated map collections. Only two museums specified the packaging material: in one museum problems occur within PVC bags, while the other mentioned cardboard boxes.

Those 56 museums that ticked off at least one category of initial question Q42 were also asked about the portion of museum objects that are stored either in packaging specifically designed for storage of museum objects, in ordinary types of packaging, or without any packaging (Q58) (Table 19). Most of the museums (59 %) store only a smaller number of objects in packaging specifically designed for storing museum/archive/gallery objects, while somewhat more than one-quarter (27 %) stores a larger portion in this kind of packaging. A good third (34 %) of museums stores a larger share of objects in ordinary packaging, such as shoe and flower boxes, 41 % of museums only store a smaller number of objects in such packaging, while one-quarter (25 %) does not use it. A smaller number of items is stored without packaging in the case of 54 % of the museums, 41 % of the museums store a larger share of objects unpackaged, and only three museums store zero items completely without packaging.

Table 19: How many museum objects are stored in specialized packaging that is specifically designed for storing museum/archive/gallery objects, how many in the ordinary packaging, and how many without packaging? (Q58)

n = 56		None	Smaller n.	Larger n.
a	In packaging specifically designed for storage	8 14.3 %	33 58.9 %	15 26.8 %
b	The ordinary packaging (e.g. shoe boxes, boxes of flowers, etc.)	14 25.0 %	23 41.1 %	19 33.9 %
c	No packaging	3 4.4 %	30 53.6 %	23 41.1 %

The 42 museums that declared utilisation of ordinary packaging were further asked whether they physically separate the object from the packaging with another, entirely inert material (e.g., do they line the cardboard box with acid-free paper or wrap the item in this kind of paper) (Q59). As many as 20 museums (48 %) answered in the affirmative for most items stored in ordinary packaging. Twelve museums (29 %) never employ such a method, while 10 museums (24 %) use it in the case of specific museum objects. The latter were requested to name the types of objects. Three respondents noted works on paper, two textile items and two sensitive objects, while other listed possibilities were each mentioned by one museum only. The 53 museums that store a smaller or larger number of items without packaging were invited to give a response to question Q60 regarding the utilisation of any additional material that represents protection or barrier between the material from which the storage furniture is made and the object itself (e.g., do they place a layer of inert material [foil, foam, paper] between the object and a shelf). Fourteen museums (26 %) responded affirmatively for all or most of the objects, 18 museums (34 %) never use such a method, while 21 museums (40 %) employ it only in connection with certain types of objects or storage furniture. Amongst the latter, eight museums stated the types of furniture and 15 the types of objects (Q61). Five museums indicated wooden storage furniture, two metal furniture; one museum mentioned bookshelves and one mentioned a piece of furniture with sliding elements. Among the museums' objects, the majority mentioned were from organic materials, such as textiles (5 museums), works on paper (3) and wooden objects (2), while metals were mentioned by three museums in the category of inorganic objects. Four museums stated paintings, two stated technical objects, two stated sensitive objects, whereas other categories among the coded responses were each only used once.

The 35 museums that responded affirmatively to question Q60 (use of additional material that represents protection or barrier between the material of the furniture and the object) were further asked about the purpose of the additional material (Q62). The majority (48 %) of respondents uses such a material to avoid contact between the materials of storage furniture and the object itself, although many also employ it to stabilise and prevent movement of the museum objects (42 %). Within the option "other", two museums stated protection against mechanical factors and two stated protection against environmental factors; two museums try to avoid contact between different museum objects with such method and one indicated diagnostics.

A question followed regarding objects stored in depots that should be packed in special packaging materials but are not (Q63). As many as 39 museums (64 %) hold such items. To the supplementary question (Q64), inquiring about the causes for this status, 35 museums indicated a lack of financial resources, seven museums mentioned inadequate storage protocols for museum objects, and four stressed inappropriate packaging available on the market. Within the category "other", some also listed shortage of storage space (10 museums), lack of working staff (3), time (2) and equipment (1), as well as the need for tailored packaging (2 museums).

The latter 39 museums were also asked which types of objects lack special packaging and what kind of packaging would be appropriate for them (Q65). The respondents pointed out objects of larger size (6 museums), works on paper (6), textiles (6), photographic (6) and ethnographic collections (6), furniture (5), works of art (5), wooden objects (4) and biological collections (4). Almost one-third of the museums either specified none of the packaging materials or their responses could not be categorised, while the rest mostly stressed the need for boxes and crates.

The 48 museums that keep items in specialized packaging (specifically designed for storage of museum/archive/gallery objects) were invited to respond to question Q66, enquiring of barrier materials or coatings incorporated in such packaging. The majority of the museums (42 museums) responded that the packaging they use does not include properties of the sort. The rest of all six of the museums stated the packaging contains coatings against burning, while three of them also ticked off coatings against moisture, two against light radiation and two against fats. Three of them also completed the category "other" where one of the museums listed the utilisation of anti-corrosive foil for packaging of metal objects, another anti-dust protection, and the third museum coated archival cardboard folders (coating properties unknown). The latter six museums were also questioned about the objects they pack in such special packaging (Q67). Three of them answered photographic collections, two metal objects, two works on paper, and two textile items. One museum additionally listed objects sensitive to moisture, items of ethnographic collections, weapons and technical objects.

The following question was posed as an enquiry about whether the market holds enough suitable packaging materials and systems for long-term storage of museum objects and if there are any deficiencies regarding existing packaging (Q68). Thirteen museums chose not to respond to the question. Eleven replied they do not know the answer to the question. The majority of the rest (24 museums) concurred the market offers enough suitable packaging materials and systems. Only three museums stressed the shortage of packaging materials and systems on the market, and seven museums pointed out their shortfall within the Slovene market. Listed shortcomings of existent packaging materials and systems were mostly associated with financial issues (in the case of 22 museums), four museums indicated inappropriate packaging dimensions, two museums inappropriate packaging in general, and one stressed the packaging is inadequate for sensitive objects. Only five museums declared there aren't any problems with the existing packaging. Eight answers were unable to be categorised.

Under question Q69, the museums were requested to assess the importance of listed properties of packaging materials or systems (Table 20). As very important, the respondents chose easily processed

packaging material and its fire retardancy above all others (77 % of the museums in both cases). Subsequent important properties are reusability (74 % of museums), tool-less and adhesive-less use of packaging material (72 %), possibility of self-made packaging design (67 %), incorporation of barrier substances to prevent the impact of environmental factors (66 %), as well as material inertness (50 %). As less important properties, museums mostly tagged adjustability of the material (84 % of the museums) and multi-functionality (75 %), along with colour and tone diversity (48 %), transparency (44 %) and sensors incorporation (38 %). The least necessary property for packaging is to be pleasant to the touch since almost half (49 %) of the respondents deem it not important. In the optional category "other", one museum outlined the importance of electronic chips.

Table 20: How important is it for material for the long-term packaging of museum objects in depots to have the following characteristics? Is it not important, of little importance or very important? (Q69)

n = 61		Not important	Of little importance	Very important	Don't know
a	Transparency	5 8.2 %	27 44.3 %	23 37.7 %	6 9.8 %
b	Colour diversity (for easier sorting)	17 27.9 %	29 47.5 %	10 16.4 %	5 8.2 %
c	Diversity of tones (bright, dark, etc.)	21 34.4 %	29 47.5 %	5 8.2 %	6 9.8 %
d	Pleasant to touch	30 49.2 %	22 36.1 %	3 4.9 %	6 9.8 %
e	Inertness	3 4.9 %	15 24.6 %	28 49.9 %	15 24.6 %
f	Flame-retardant	2 3.3 %	5 8.2 %	47 77.1 %	7 11.5 %
g	Reusability	0 0.0 %	10 16.4 %	45 73.8 %	6 9.8 %
h	Multifunctional (for supports, boxes, reinforcement, wrapping, etc.)	10 16.4 %	46 75.4 %	5 8.2 %	6 9.8 %
i	Adjustability (possibility of packaging different types and sizes of mus. obj.)	5 8.2 %	51 83.6 %	5 8.2 %	6 9.8 %
j	Possibility of self-made packaging design (e.g., making a box of suit. dim.)	3 4.9 %	12 19.7 %	41 67.2 %	5 8.2 %
k	Possibility of use without tools or glue	1 1.6 %	11 18.0 %	44 72.1 %	5 8.2 %
l	Easy processing (cutting, folding, tearing, joining, etc.)	1 1.6 %	9 14.8 %	47 77.1 %	4 6.6 %
m	Incorporation of barrier substances to prevent the impact of environm. fac.	2 3.3. %	13 21.3 %	40 65.6 %	6 98. %
n	Presence of sensors for monitoring the conditions within the packaging	6 9.8 %	23 37.7 %	19 31.2 %	13 21.3 %

With question Q70, we tried to further examine interest regarding packaging equipped with sensors. Therefore, museums were asked to rate the practicality of specific types/functions of sensors (Table 21). Relative humidity and temperature sensors were listed as very useful by the majority of the respondents, 73 % and 68 %, respectfully. Museums also found very useful sensors for monitoring biological activities (66 % of the museums) and light (57 %), as well as monitoring of VOCs (45 %). Sensors for vibration monitoring were tagged by the majority of the museums as a of medium use (39 %), while a good quarter finds them very useful (28 %) and almost a third finds them of little use (32 %).

Table 21: If the packaging included sensors, how useful do you find the following sensor functions? (Q70)

n = 56		Of little use	Of medium use	Very useful
a	Monitoring of relative humidity	2 3.6 %	13 23.2 %	41 73.2 %
b	Monitoring of temperature	4 7.1 %	14 25.0 %	38 67.9 %
c	Monitoring of light radiation	10 17.9 %	14 25.0 %	42 57.1 %
d	Monitoring of biological activity	8 14.3 %	11 19.6 %	37 66.1 %
e	Monitoring of Volatile Organic Compounds (VOC)	11 19.6 %	20 35.7 %	25 44.6 %
f	Vibration monitoring	18 32.1 %	22 39.3 %	16 28.6 %

Under question Q71, an attempt was made to research museums' financial resources available for the purchase of packaging materials for storage of museum objects (e.g., paper, boxes, foils, foams) in the preceding year (i.e., 2017). We were also interested in the resources available for the purchase of specific storage equipment, such as sensors and storage furniture systems (Q73). Further on, we also wanted to explore the additional financial resources museums would be willing to invest into the packaging materials (Q72) and equipment (Q74), provided such investment would considerably upgrade storage standards. For every question, some museums were not able or willing to reply, or their answers could not be categorised. In particular, this was the case regarding the question of additional financial resources where 42 % of respondents could not provide an adequate answer. Valid answers were classified into seven groups, as shown in Table 22.

In 2017, almost one-fifth of the museums (18 %) did not invest any financial means into the purchase of packaging materials, and almost two-fifths of the museums (39 %) did not invest in storage equipment. Up to euro1.000 was spent in 2017 by 30 museums (55 %) for packaging, while only 12 museums (22 %) spent an equal amount for equipment. Conversely, more than 1.000 euro was spent by 21 museums (39 %) for equipment, while fewer (i.e., 15 museums [27 %]) invested such a sum into packaging.

Four museums would not invest any additional funds into packaging even if such investment would greatly improve storage conditions of museum objects. Sixteen museums would invest up to 1.000 euro, and 15 museums would be willing to invest over 1.000 euro per year. Five museums would not give any additional funds to depot equipment, even if that would improve storage conditions. Ten museums would give less than a thousand euros and 20 museums would give a thousand or more euros.

Table 22: Financial resources dedicated to the purchase of packaging materials and/or systems and equipment for the depots (Q71, Q72, Q73, Q74)

		Financial resources for packaging materials/syst.		Financial resources for equipment for the depots	
		Q71. Last year (n = 55)	Q72. Additional (n = 35)	Q73. Last year (n = 54)	Q74. Additional (n = 35)
0	Zero	10 18.2 %	4 11.4 %	21 38.9 %	5 14.3 %
1	From 1 to less than 100 euro	7 12.7 %	7 20.0 %	3 5.6 %	4 11.4 %
2	From 100 to less than 500 euro	10 18.2 %	5 14.3 %	4 7.4 %	5 14.3 %
3	From 500 to less than 1.000 euro	13 23.6 %	4 11.4 %	5 9.3 %	1 2.9 %
4	From 1.000 to less than 5.000 euro	11 20.0 %	10 28.6 %	14 25.9 %	13 37.1 %
5	From 5.000 to less than 10.000 euro	3 5.5%	4 11.4 %	6 11.1 %	5 14.3 %
6	10.000 or more euro	1 1.8 %	1 2.9 %	1 1.9 %	2 5.7 %

At the end of Section D, the question was posed whether museums hold any packaging systems specially designed for quick evacuation in cases of natural and other disasters (Q76). Only three museums replied affirmatively. The rest of the 58 museums do not have such packaging; therefore, they were asked what kind of packaging they would acquire in such events (Q78). A majority, i.e., 17 museums, feel the necessity for packaging resistant to specific climatic factors. Many replies could not be categorised, while the rest stressed the need for boxes, especially wooden (6 museums) or metal boxes and crates (6 museums). Five museums emphasised that the packaging ought to be easily portable.

3.5 Transportation of museum objects

In the last part of the questionnaire, Section E, we initially asked about the types of packaging materials and systems that are typically used for the transportation of museum objects (Q80). The majority of museums, namely almost half of all respondents (i.e. 30 museums), indicated they use polyethylene bubble wrap. The second most common reply was wooden boxes and crates (20 museums), followed by

cardboard boxes (17 museums). Four museums answered they do not use any packaging for museum objects transportation. In addition, we also inquired about problems the respondents might have in connection with packaging for objects transportation (Q81). Almost half of the respondents (29) affirmed they encounter problems, while the other half (32 museums) denied such issues. The first half was asked to describe the problems they encounter (Q84). In most cases, they identified unsuitable packaging, of which seven respondents specifically stated inappropriate packaging dimensions. Six museums indicated financial issues, three respondents stressed unawareness of the museum staff, three inappropriate museum infrastructure, four respondents listed inadequate vehicle or its equipment, while two mentioned mechanical factors and one suboptimal climatic conditions. None of the museums applies any kind of sensors that would monitor environmental conditions in the packaging systems during transportation of museum objects (Q82). Eleven museums (18 %) employ vehicles equipped with climate control systems, while most of the museums (82 %) do not use them, or such vehicles are not at their disposal (Q83).

3.6 Final comments of participating respondents

At the end, we asked museums if they have a comment that was not asked within the questionnaire or if they would like to propose a question for further research (Q87). While some museums left the field blank or answered they do not have any comments, 21 museums did provide remarks and suggestions. Some inputs referred to the survey and/or the questions in the questionnaire, while the majority were general remarks that we partially or fully list below:

- "At the outset we did not have depot spaces that would be of appropriate size or adequately equipped to fulfil the standards regarding which this questionnaire is all about."
- "Question regarding general shortage of depot spaces, and how to obtain adequate depots."
- "Protection of depots: access, fire safety … Collection management situation will not change unless museums will be bound to adopt and respect internal protocols and regulations which is standard practice abroad (the role of the founder, the funder, and the inspection service); and unless museums and their staff will not regard the maintaining and safeguarding of items as museums' constitutive mission, and the requests of individuals will stop being understood as spluttering or even harassment. Therefore – museums ought to be more professional on the one hand, and the supervision over their work reinforced on the other. All the while, a greater quantity of professional training is in order."
- "Above all, we deal with issues of inadequate facilities and climatic conditions for storage of museum objects. Additionally, we have shortage of staff and financial resources for the purchase of equipment and materials, which both influence depots' organisation."
- "In our case, the shortage of depot spaces is crucial. We hope, we will find a solution regarding this issue in the next few years since the municipality repurchased the facility for museum depot purposes. However, the facility needs yet to be adequately renovated and organised. We hope the investor will meet our needs regarding climatic and other conditions."

- "I regard the problem of maintaining sufficient storage standards and transportation of museum objects predominantly as the consequence of shortfall of financial means, which would provide sufficient equipment for maintenance and surveillance of museum objects."
- "Above all, the museum wishes for special depot facility with central control HVAC system and enough storage space for all items."
- "Our museum is small and dedicated mostly to the intangible heritage […]. The items we store are mostly connected with paper collections (books and other works on paper), we also store several works of art, and items [of specific ethnographic collection]. As probably majority of the museums, we encounter problems with depots (which are too small), although due to lesser number of objects we store, our situation is probably different and somewhat manageable."
- "[…] we do not have a depot in the strict sense of the word, we only have a provisional one […] where we store majority of the objects. Otherwise, our entire collection is part of permanent exhibitions (graphics excluded)."
- "In my opinion, the State, which grants the Authorisation for Carrying out the National Public Service of Museums, should help museums like ours at least with additionally educating the authorised local entities, which provide a museum with facilities, on the importance of museums depots as basic means and standards for museum's activities. A word from a museum's director is often insufficient, and in an environment, where every public space is valuable, a museum's depot is frequently understood as a warehouse that could be accommodated within areas of substandard quality, yet even those are considered a waste of money."

Several museums also provided suggestions for further research:

- "To what extent museums in Slovenia carry out transportation of museum objects by themselves or hire suppliers in the market?"
- "Participation of founders (local communities) in creating the conditions for museum objects storage, financial investment of founders, legislative obligations fulfilment of founders."
- "We propose a research to what extent the legally binding standards are employed in national museums and galleries or managed with assets owned by the State (and in what percentage), and what are the differences regarding the storage conditions according to the types of collections they hold […]."
- "We propose a holistic evaluation of individual depots at the national level, and systemic solutions that will also be carried out in the form of special-purpose assets. We are aware of the problems and try to better the situation step by step as far as available financial means permit."
- "How to obtain more depots, and orderly arrangement within."
- "Museum staff, ratio of the number of objects and professional staff, restoration and conservation care, financing."

4 CONCLUSIONS

Sixty-one museums participated in the survey, which stands for 80 % of all invited corresponding institutions. On an individual case, the questionnaire was mainly filled out by museums' directors and curators, sometimes by other museum staff. Results:

- Museums' depots are mainly located within the museum building as well as in other, remote locations.
- In the case of more than half of the museums, the depot floor area covers less than 250 m^2, and the average height of a depot space measures between 2 and 3 m. Most of the museums have more than one depot space of average size up to 100 m^2.
- The most important criteria according to which museum objects are stored in an individual depot space is identical/similar material.
- The majority of museums store objects in open types of furniture, while a smaller number of items is kept in closed furniture systems or without furniture.
- Open as well as closed types of furniture, utilised by most of the museums, are generally made of metal, processed with protective coatings. In both types of furniture, objects made of organic materials are mostly stored. Outside of furniture systems, museums commonly store objects of specific size, namely larger items.
- More items are exposed to environmental factors in open furniture systems (in comparison to closed). According to respondents, items were the most exposed to dust in the first place, although a high percentage of items' exposure was also due to changes in temperature and relative humidity. Museums estimate that there is a high exposure to these two factors even in closed furniture systems.
- Most frequently, museums inspect items made of organic materials, usually at least once per month.
- Depots of most of the museums in Slovenia are not connected to HVAC systems. Those with HVAC systems mostly installed separate HVAC systems for depot and exhibition areas and can set different climatic conditions at least for some depot spaces.
- A greater number of museums monitors only two climatic factors in the depots — temperature and relative humidity. For both factors, the majority also keeps annual records. Set value for relative humidity is generally 50 %, with 5 % deviation tolerance in wintertime, and 10 % in the summertime. Temperature in most of the museums is set to 20°C; some museums maintain this value over the wintertime, although many lower it to 15°C. The temperature deviation in many museums is ±2°C. A major part of the respondents also stressed at least occasional issues in maintaining stable conditions in certain periods of the year.
- A relatively commonly monitored environmental factor is also biological pests. Almost none of the museums monitor VOCs.
- The most utilised packaging for long-term storage of museum objects is different types of boxes (mostly cardboard), papers (mostly acid-free) and protective folders (made of PE or PP). The least used are fillers.

- When storing items in packaging that can be sealed or closed (e.g., boxes and bags), the packaging is usually left open.
- A greater number of museum objects is stored without packaging. There are lots of items that would require special packaging; however, most of the museums cannot afford it.
- In case of new material development for packaging museum objects, packaging should be above all incombustible and capable of easy processing (cutting, folding, tearing, joining).
- The application of sensors within the packaging does not seem to be an important packaging property; however, if the packaging would include sensors, those that monitor temperature and relative humidity seem most practical to the respondents.
- In 2017, some museums have not invested any means in the purchase of packaging nor depot equipment (sensor, storage furniture). Similarly, modest are future plans of such investments.
- Almost none of the museums hold any packaging systems specially designed for quick evacuation in cases of natural and other disasters.
- The majority of the museums mostly use polyethylene bubble wrap for transportation of museum objects, as well as wooden boxes and crates. For transportation, most museums also do not use vehicles equipped with climate control systems or any kind of sensors that would monitor environmental conditions during the transportation of museum objects.

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6 APPENDIX

- Appendix A: Survey Questionnaire
- Appendix B: List of museums

6.1 Appendix A: Survey Questionnaire

Dear Sir/Madam,

This is a questionnaire on the conditions of storing museum objects, prepared by researchers at the InnoRenew CoE Center of Excellence and the Institute for the Protection of Cultural Heritage of Slovenia. We are asking about the organization of museum depots and the long-term preservation of museum objects in them, about the climatic conditions in the depots, the use of HVAC systems (heating, ventilation and air conditioning), the long-term packaging of museum objects in additional packaging and the transport of museum objects. We ask for the questionnaire to be filled out by the person in your museum who has the best overview of the topics listed above. If there are several people, they should answer the questionnaire together. Filling out the survey will take from 10 to 20 minutes (depending on how complex your depots are).

The data will be used in the framework of the project on the production of advanced materials for the protection of cultural heritage. The processed data will be used in research publications, for educational purposes and for the purpose of future research. The database is stored in the Zenodo Repository, where it will be available to third parties. We will remove your names and surnames, as well as the names of museums and galleries. As participants, you will also receive a summary of the results. If you have questions about the content of the study, please contact Dr. Ana Slavec (ana.slavec@innorenew.si).

Thank you in advance for your cooperation. By clicking on the Next page, you start completing the questionnaire.
Dr. Polonca Ropret

Q2 - Name of museum/gallery
The name of museum/gallery will be used for internal analysis only and won't be published within publicly available survey results.

Q3 - Working post of the respondent within the museum/gallery
Please name the working post of the main respondent only.

◯ Director
◯ Curator
◯ Conservator-restorer
◯ Other:

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q4 - In the first part of the questionnaire, we will be interested in how the depots in your museum are organised and which museum objects are stored in them permanently or for longer periods. The term 'depot' in this questionnaire refers to the entire spatial unit which is intended for the permanent storage of museum objects in a given building. The term 'depot space' in this questionnaire refers to a single space in the depot (room, hall, etc.) which is physically separated from the other rooms by walls and doors.

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q5 - Where are the depots of your museum located?
Multiple answers are possible

☐ Within the museum building
☐ At the location or locations separated from the museum building

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (2) Q5 = [Q5a] and Q5 = [Q5b]
Q6 - Where do you store the majority of museum items?

○ Within the museum building
○ At a location separated/away from the museum building

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (2) Q5 = [Q5a] and Q5 = [Q5b]
Q7 - When answering the questions below, keep in mind only the location where you store the majority of museum objects.

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q8 - What are the measurements (in square meters) of the whole depot area intended for the storage of museum objects?

_____ square meters

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q9 - What is the average height of the depot space intended for the storage of museum objects?
Please indicate at least an approximate value.

_____ meters

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q10 - Into how many depot spaces (physically separated from each other with walls and doors) is the depot divided?

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (3) Q10 = '1'
Q11 - Is the depot space subdivided (e.g. with partition walls among which there are no doors)? Please describe how.

- ○ No, all inventory is in a single, partitions-free room
- ○ Yes, the room is subdivided, namely:

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (4) Q10 > '1'
Q12 - What is the average surface of the depot space (in square meters)?
Please indicate at least an approximate value.

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (4) Q10 > '1'
Q13 - According to which criteria are museum objects stored in the depot spaces? Please sort them from the most to the least enforced, where 1 means the most enforced and 4 the least enforced.

Identical/similar material	
Identical/similar type of object	
Identical/similar climatic requirements	
According to curatorial department	

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (4) Q10 > '1'
Q14 - Do you take into account any other criteria that is not listed above, when storing museum objects?

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q15 - What share of museum objects are stored in closed furniture systems, in open furniture systems, and without furniture? None of the objects, smaller number of objects or larger number of objects?

	None of the objects	Smaller number of objects	Larger number of objects
Closed furniture systems (drawers, cabinets, chambers etc.)	○	○	○
Open furniture systems (open shelving systems, art racks etc.)	○	○	○
Without furniture	○	○	○

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (5) Q15a = [2, 3]
Q16 - From which materials are your closed furniture systems made of? Please tick corresponding boxes.
Multiple answers are possible

- ☐ Powder-coated metal furniture, manufactured by specialized manufacturers according to standards for the preservation of museum items
- ☐ Furniture made of metal, processed with protective coatings
- ☐ Furniture made of metal, not processed with protective coatings
- ☐ Solid wood furniture processed with protective coatings
- ☐ Furniture made of solid wood
- ☐ Furniture made of chipboard
- ☐ Furniture made of OSB boards
- ☐ Furniture made of plastic

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (5) Q15a = [2, 3]
Q17 - Which types of objects are usually stored in closed furniture systems? For example: depending on the dimension, the sensitivity to certain climatic and environmental factors, the fragility and specificity of the materials etc.

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (5) Q15a = [2, 3]
Q18 - How many objects currently stored in closed furniture systems, are exposed to the following environmental factors?

	No objects	Smaller number of objects	Larger number of objects	Don't know
Dust	◯	◯	◯	◯
Light radiation	◯	◯	◯	◯
Larger relative humidity fluctuations	◯	◯	◯	◯
Larger temperature changes	◯	◯	◯	◯
Microbial infection (moulds etc.)	◯	◯	◯	◯
Insect infestation	◯	◯	◯	◯
Rodent infestation	◯	◯	◯	◯
Gaseous pollutants	◯	◯	◯	◯
Influences of furniture materials in/on which objects are stored	◯	◯	◯	◯
Influences of other museum items stored next to them	◯	◯	◯	◯
Other:	◯	◯	◯	◯

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (6) Q15b = [2, 3]
Q19 - From which materials are your open furniture systems made of? Please tick corresponding boxes.
Multiple answers are possible

- ☐ Powder-coated metal furniture, manufactured by specialized manufacturers according to standards for the preservation of museum items
- ☐ Furniture made of metal, processed with protective coatings
- ☐ Furniture made of metal, not processed with protective coatings
- ☐ Solid wood furniture processed with protective coatings
- ☐ Furniture made of solid wood
- ☐ Furniture made of chipboard
- ☐ Furniture made of OSB boards
- ☐ Furniture made of plastic

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (6) Q15b = [2, 3]
Q20 - Which types of objects are usually stored in open furniture systems? For example: depending on the dimension, the sensitivity to certain climatic and environmental factors, the fragility and specificity of the materials etc.

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (6) Q15b = [2, 3]
Q21 - How many items currently stored in open furniture systems, are exposed to the following environmental factors?

	No objects	Smaller number of objects	Larger number of objects	Don't know
Dust	◯	◯	◯	◯
Light radiation	◯	◯	◯	◯
Larger relative humidity fluctuations	◯	◯	◯	◯
Larger temperature changes	◯	◯	◯	◯
Microbial infection (moulds, etc.)	◯	◯	◯	◯
Insect infestation	◯	◯	◯	◯
Rodent infestation	◯	◯	◯	◯
Gaseous pollutants	◯	◯	◯	◯
Influences of furniture materials in/on which items are stored	◯	◯	◯	◯
Influences of other museum items stored next to them	◯	◯	◯	◯
Other:	◯	◯	◯	◯

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (7) Q15c = [2, 3]
Q22 - Which types of objects are usually stored outside the furniture system? For example: depending on the dimension, the sensitivity to certain climatic and environmental factors, the fragility and specificity of the materials etc.

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q23 - Which museum objects, stored in the depot, are most frequently inspected (e.g. for possible changes, signs of deterioration etc.)?

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q24 - How often are these objects inspected?

- ○ At least once per week
- ○ At least once per month
- ○ At least once per year
- ○ Less frequently

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q25 - Who carries out the inspection of these objects?
Multiple answers are possible

- ☐ Curator
- ☐ Conservator-restorer
- ☐ Other:

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
Q26 - Do you store any objects in the depot which are never or extremely rarely inspected?

- ○ Yes
- ○ No

BLOCK (1) (A. ORGANISATION OF DEPOTS AND LONG-TERM STORAGE OF MUSEUM OBJECTS)
IF (8) Q26 = [1]
Q27 - Which objects are never or extremely rarely inspected?

BLOCK (9) (B. HVAC SYSTEMS (HEATING, VENTILATION AND AIR-CONDITIONING))
Q28 - In this section, we are interested in heating, ventilation and air conditioning (HVAC) systems in your museum depot.

BLOCK (9) (B. HVAC SYSTEMS (HEATING, VENTILATION AND AIR CONDITIONING))
Q29 - Are the depot spaces connected to the HVAC system?

◯ Yes, all depot spaces
◯ Most depot spaces
◯ Minority of depot spaces
◯ None of the depot spaces

BLOCK (9) (B. HVAC SYSTEMS (HEATING, VENTILATION AND AIR CONDITIONING))
IF (10) Q29 != [4]
Q30 - Are the depot spaces connected to the same HVAC system as exhibition areas, or is there a separate system?

◯ All areas are connected to the same HVAC system
◯ The systems are separated

BLOCK (9) (B. HVAC SYSTEMS (HEATING, VENTILATION AND AIR CONDITIONING))
IF (10) Q29 != [4]
IF (11) Q30 = [2]
Q31 - In how many individual depot spaces/rooms can you set different climatic conditions?

◯ In none - all the depot spaces are connected to the same system
◯ In every depot space
◯ In some depot areas (please indicate the approximate percentage, considering all the rooms)

BLOCK (9) (B. HVAC SYSTEMS (HEATING, VENTILATION AND AIR CONDITIONING))
IF (10) Q29 != [4]
IF (11) Q30 = [2]
IF (12) Q31 = [1, 3]
Q32 – In depot spaces connected to the same HVAC system, do you only store objects with similar requirements regarding climatic conditions, or objects that should be stored in different climatic conditions as well?

◯ Only objects that have similar requirements for climatic conditions
◯ Also objects that should be kept under different climatic conditions (please indicate the approximate percentage of items that are stored in inappropriate climatic conditions)

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
Q33 - The areas of interest in the following section are climatic conditions in the depots.

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
Q34 - Which environmental factors do you monitor in all depot spaces, which only in some depot spaces and which in none of the depot spaces?

	In all depot spaces	Only in some depot spaces	None of the depot spaces
Relative humidity	◯	◯	◯
Temperature	◯	◯	◯
Visible light	◯	◯	◯
UV light	◯	◯	◯
Particulate pollutants	◯	◯	◯
Gaseous pollutants	◯	◯	◯
Biological pests	◯	◯	◯
Other:	◯	◯	◯

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
Q35 - Which environmental factors do you monitor, what kind of sensors/devices/techniques do you use, and do you keep an annual record for them?

	Type of sensor/device/technique used to monitor this factor	Do you keep an annual record for this factor?
Relative humidity		☐
Temperature		☐
Visible light		☐
UV light		☐
Particulate pollutants		☐
Gaseous pollutants		☐
Biological pests		☐
Other		☐

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
Q36 – Which particulate pollutants do you monitor?
Multiple answers are possible

- ☐ PM10
- ☐ PM2.5
- ☐ None of these

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
Q37 - Which gaseous pollutants do you monitor?
Multiple answers are possible

- [ ] Sulphur dioxide (SO2)
- [ ] Ozone (O3)
- [ ] Nitrogen dioxide (NO2)
- [ ] Chlorine (Cl2)
- [ ] Hydrogen chloride (HCl)
- [ ] Acetic acid (CH3COOH)
- [ ] Formaldehyde (HCHO)
- [ ] Ammonia (NH3)
- [ ] Volatile organic compounds (VOCs)
- [ ] Carbon monoxide (CO)
- [ ] Carbon dioxide (CO2)
- [ ] Other:
- [ ] None of these

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
IF (14) Q29 != [4] and Q17a = [1, 2] or Q17b = [1, 2]
Q38 - What are the set points of climatic conditions in depot spaces containing mixed collections (e.g. RH: 50 %, T:20 °C)? If you can set a deviation from the set point (e.g. RH: ± 10%, T: ± 2 ° C, etc.), enter it in the corresponding column.

	Set value (summer time)	Deviation (summer time)	Set value (winter time)	Deviation (winter time)
Relative humidity (%)				
Temperature (°C)				

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
IF (14) Q29 != [4] and Q17a = [1, 2] or Q17b = [1, 2]
Q39 - Which recommendations do you use for setting the climatic conditions?
Multiple answers are possible

- [ ] "Rules on the Preservation and Storage of National Treasures and Museum Material, on the Entry in the Museum Register and on Granting the Authorisation for Carrying out the National Public Service of Museums. Appendix 1." (Official Gazette of the Republic of Slovenia no. 110/08, 32/09 and 47/12)
- [ ] Published international standards (which?)
- [ ] Recommended values in literature (which?)
- [ ] Settings are made according to past experiences in the museum
- [ ] Other:

BLOCK (13) (C. CLIMATIC CONDITIONS IN DEPOT)
Q40 - What is your assessment of the state of the climatic conditions in the depots?

- ◯ We maintain stable conditions throughout the year
- ◯ Certain problems occur in some periods of the year
- ◯ We have bigger problems with maintaining a stable situation throughout the whole year

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q41 - In the next section we are interested in the long-term packaging of museum objects (objects packed in packaging materials/systems (e.g. boxes, wrappings etc.) during long-term storage in depots).

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q42 – Which types of packaging material for long-term packaging of museum objects do you currently use?
Multiple answers are possible

- ☐ Paper
- ☐ Bags
- ☐ Boxes
- ☐ Boards/bases/foams
- ☐ Textiles/fabric
- ☐ Films/foils
- ☐ Protective folders
- ☐ Fillers
- ☐ Other:
- ☐ Currently, we do not use any materials

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (16) Q42 = [Q42a]
Q43 - Which paper materials do you currently use for the long-term packaging of museum objects?
Multiple answers are possible

- ☐ Ordinary paper
- ☐ Absorbent paper
- ☐ Newspaper
- ☐ Waxed paper
- ☐ Siliconized paper
- ☐ Acid-free paper
- ☐ Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (16) Q42 = [Q42a]
IF (17) Q43 = [Q43f]
Q44 - Do you use buffered or unbuffered acid-free paper?
Multiple answers are possible

- [ ] Buffered acid-free paper
- [ ] Unbuffered acid-free paper
- [ ] Don't know

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (18) Q42 = [Q42b]
Q45 - Which bag materials do you currently use for the long-term packaging of museum objects?
Multiple answers are possible

- [ ] PVC bags
- [ ] Bags made of absorbent paper
- [ ] Polyethylene/polypropylene bags
- [ ] Paper bags
- [ ] Bags made of waxed paper
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (19) Q42 = [Q42c]
Q46 - Which box materials do you currently use for the long-term packaging of museum objects?
Multiple answers are possible

- [ ] Boxes made of paperboard
- [ ] Cardboard boxes
- [ ] Polyethylene/polypropylene boxes
- [ ] Wooden boxes/containers
- [ ] Metal boxes
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (20) Q42 = [Q42d]
Q47 - What kind of boards, bases or foams do you currently use for the long-term packaging of museum objects?
Multiple answers are possible

- [ ] Paperboard
- [ ] Cardboard
- [ ] Acid-free cardboard
- [ ] Wood
- [ ] Chipboard
- [ ] OSB boards
- [ ] Polyethylene/polypropylene boards/bases/foams
- [ ] Polyurethane boards/bases/foams
- [ ] Polyethylene bubble bases
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (21) Q42 = [Q42e]
Q48 - Which textile materials do you use for long-term packaging of museum objects?
Multiple answers are possible

- [ ] Unbleached silk
- [ ] Bleached/coloured silk
- [ ] Unbleached linen
- [ ] Bleached/coloured linen
- [ ] Unbleached cotton (calico)
- [ ] Bleached/coloured cotton
- [ ] Unbleached wool
- [ ] Bleached/coloured wool
- [ ] Tyvek
- [ ] Vrteks
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (22) Q42 = [Q42f]
Q49 - Which film/foil materials do you currently use for the long-term packaging of museum objects?
Multiple answers are possible

- [ ] Mylar (polyester)
- [ ] Hostaphan (polyester)
- [ ] Melinex (polyester)
- [ ] Polyethylene/polypropylene foils
- [ ] Polyethylene bubble wraps
- [ ] PVC
- [ ] Cellophane
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (23) Q42 = [Q42g]
Q50 - Which materials of protective folders do you currently use for long-term packaging of museum objects?
Multiple answers are possible

- [ ] Polyethylene/polypropylene foils
- [ ] Polyester foils
- [ ] PVC
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (24) Q42 = [Q42h]
Q51 - Which fillers do you currently use for long-term packaging of museum objects?
Multiple answers are possible

- [ ] Bleached cotton wadding
- [ ] Unbleached cotton wadding
- [ ] Synthetic wadding
- [ ] Polystyrene foams/flakes
- [ ] Polyurethane foams/flakes
- [ ] Polyethylene/polypropylene foams/flakes
- [ ] Biodegradable packing flakes
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (25) Q42 = [Q42b]
Q52 - Do you seal/close the bags in which you store museum objects?

- ○ Always/in most cases
- ○ Only for some objects
- ○ Never

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (26) Q42 = [Q42c]
Q53 - Do you seal/close the boxes in which you store museum objects?

- ○ Always/in most cases
- ○ Only for some objects
- ○ Never

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (27) Q52 = [2]
Q54 - Which objects do you seal/close within the bags? Please, describe
Multiple answers are possible

- ☐ Objects made of certain materials (please, describe which materials)
- ☐ Objects sensitive to certain environmental factors (please, describe which factors)
- ☐ Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (28) Q53 = [2]
Q55 - Which objects do you seal/close within the boxes? Please, describe
Multiple answers are possible

- ☐ Objects made of certain materials (please, describe which materials)
- ☐ Objects sensitive to certain environmental factors (please, describe which factors)
- ☐ Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (29) Q52 = [1] or Q53 = [1]
Q56 - Do certain problems occur in sealed/closed packaging (e.g. mould or other microorganisms, too low/too high relative humidity, too low/too high temperature)? In case of which packaging type and material the problems occur most commonly?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (30) Q52 = [2] or Q53 = [2]
Q57 - Do certain problems (e.g. contamination with mould or other microorganisms, particulate contamination, too low/too high relative humidity, too low/too high temperature) occur in open packaging systems (e.g. open bag, box without a cover)? In case of which packaging type and material the problems occur most commonly?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (31) Q42 != [-96]
Q58 - How many museum objects are stored in specialized packaging that is specifically designed for storing museum/archive/gallery objects, how many in the ordinary packaging, and how many without packaging?

	None of the objects	Smaller number of objects	Larger number of objects
In packaging specifically designed for storage	◯	◯	◯
The ordinary packaging (e.g. shoe boxes, boxes for flower etc.)	◯	◯	◯
No packaging	◯	◯	◯

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (32) Q58b = [2, 3]
Q59 - Do you physically separate the object from the packaging with another, entirely inert material (e.g. do you line the box with acid-free paper or wrap the item in this kind of paper etc.) when using conventional packaging (e.g. paper- or cardboard boxes, shoe boxes, wooden boxes, ordinary paper etc.)?

◯ Yes, always/in most cases
◯ Yes, but only for certain objects (please name some examples)
◯ No, never

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (33) Q58c = [2, 3]
Q60 – Do you use any additional material that represents a protection or barrier between the material from which the furniture is made and the object itself (e.g. do you place a layer of inert material (foil, foam, paper, etc.) between the object and a shelve)?

◯ Yes, for all/most objects
◯ Yes, but only for certain types of furniture or specific objects
◯ No, never

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (33) Q58c = [2, 3]
IF (34) Q60 = [2]
Q61 - In which cases do you use an additional protection or barrier material between an object and furniture? Please, name some examples for which types of furniture and/or objects.
Multiple answers possible

- [ ] For certain types of furniture (please, name some examples)
- [ ] For certain types of objects (please, name some examples)
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (33) Q58c = [2, 3]
IF (35) Q60 = [1, 2]
Q62 - For what purpose do you use the additional (protection/barrier) material?
Multiple answers are possible

- [ ] To prevent contact with the furniture material
- [ ] For better stability of objects in/on furniture or preventing their movement
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q63 - Are there items in the depot that should be packed in a special long-term packaging, but are not?

- ○ Yes
- ○ No

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (36) Q63 = [1]
Q64 – What are the reasons for these items not being packed in special packaging?
Multiple answers are possible

- [ ] Lack of financial resources to purchase suitable packaging
- [ ] Inappropriate protocol for storing objects
- [ ] There is no suitable packaging on the market
- [ ] Other:

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (36) Q63 = [1]
IF (37) Q64 = [Q64a, Q64c, Q64d]
Q65 - For which items you do not have a suitable packaging? What kind of packaging would you need for these items?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (38) Q58a = [2, 3]
Q66 - Does the specialized paper or cardboard packaging that you use also include barrier materials or coatings? Which ones?
Multiple answers are possible

- [ ] Against humidity
- [ ] Against light
- [ ] Against oxygen
- [ ] Against fats
- [ ] Against smell, aromas and gas
- [ ] Against burning
- [ ] Against microbes
- [ ] Other:
- [ ] We do not use packaging with barrier materials or coatings

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (39) Q66 = [Q66a, Q66b, Q66c, Q66d, Q66e, Q66f, Q66g, Q66h]
Q67 - For which items do you use such packaging?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q68 – In your opinion, are there enough suitable packaging materials or packaging systems for long-term storage of museum objects currently available on the market? Have you found any deficiencies regarding currently available packaging? Please explain what kind of deficiencies.

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q69 - How important is it for material for the long-term packaging of museum objects in depots to have the following characteristics? Is it not important, of little importance or very important?

	Not important	Of little importance	Very important	Don't know
Transparency	◯	◯	◯	◯
Colour diversity (for easier sorting)	◯	◯	◯	◯
Diversity of tones (bright, dark, etc.)	◯	◯	◯	◯
Pleasant to touch	◯	◯	◯	◯
Inertness	◯	◯	◯	◯
Flame-retardant	◯	◯	◯	◯
Reusability	◯	◯	◯	◯
Multifunctional (for supports, boxes, reinforcement, wrapping, etc.)	◯	◯	◯	◯
Adjustability (possibility of packaging different types and sizes of museum objects)	◯	◯	◯	◯
Possibility of self-made packaging design (for example, making a box of suitable dimensions)	◯	◯	◯	◯
Possibility of use without tools or glue	◯	◯	◯	◯
Easy processing (cutting, folding, tearing, joining, etc.)	◯	◯	◯	◯
Incorporation of barrier substances to prevent the impact of environmental factors	◯	◯	◯	◯
Presence of sensors for monitoring the conditions within the packaging and reporting any changes (e.g. temperature fluctuations)	◯	◯	◯	◯
Other:	◯	◯	◯	◯

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q70 - If the packaging included sensors, how useful do you find the following sensor functions?

	Of little use	Of medium use	Very useful
Monitoring of relative humidity	◯	◯	◯
Monitoring of temperature	◯	◯	◯
Monitoring of light radiation	◯	◯	◯
Monitoring of biological activity	◯	◯	◯
Monitoring of Volatile organic compounds (VOCs)	◯	◯	◯
Vibration monitoring	◯	◯	◯
Other:	◯	◯	◯

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q71 - How much financial resources (in €) did you spend in the museum last year for the purchase of packing material and/or packaging systems (paper, boxes, foils, foams etc.) for museum/archival objects ?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q72 - How much additional financial resources (in €) could be spent annually in the museum for the purchase of packing materials and/or systems for packaging museum/archival objects, if this would significantly improve the standard of storage?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q73 - How much financial resources (in €) were dedicated in the museum last year to purchase equipment for the depot (e.g. sensors, furniture systems)?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q74 - How much of additional funding (in €) could be annually spent in the museum for the purchase of equipment for the depot, if this would improve the standard of storage?

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
Q76 - Do you have any special systems of packaging for a quick evacuation of objects in case of natural and other disasters?

◯ Yes
◯ No

BLOCK (15) (D. LONG-TERM PACKAGING OF MUSEUM OBJECTS)
IF (40) Q76 = [2]
Q78 - What kind of packaging materials/systems would you need in cases of natural and other disasters?

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
Q79 - In the last section, we are interested in the transport and transporting of museum objects.

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
Q80 - Which packing materials/systems do you use most commonly use for transportation of museum objects?

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
Q81 - Do you encounter any problems when packaging or with the packaging materials/systems that you use for transportation of museum objects?

◯ Yes
◯ No

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
Q82 - Do you include any sensors that monitor environmental factors (such as values of relative humidity, temperature, etc.) inside the packing system, while transporting museum objects?

◯ Yes
◯ No

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
Q83 - Do you use vehicles with climate control (re-creating appropriate climatic conditions inside the vehicle)?

◯ Yes
◯ No

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
IF (42) Q81 = [1]
Q84 - What kind of problems do you encounter when packaging or with packaging materials/systems that you use for transportation of museum objects?

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
IF (43) Q82 = [1]
Q85 - Which environmental factors do you monitor (inside the vehicle)?

BLOCK (41) (E. TRANSPORTATION OF MUSEUM OBJECTS)
IF (44) Q83 = [1]
Q86 - Does the vehicle have a climate monitoring system?

- ○ Yes
- ○ No

Q87 - Do you have any comment regarding other issues that were not included in this questionnaire? Would you like to suggest any questions for future research?

Q88 - Would you be prepared to participate in a joint debate with other museum representatives on the subject of conditions in museum depots and packaging of museum objects?

- ○ **Yes**
- ○ **No**

6.2 Appendix B: List of Museums

Slovenian name	English translation	Local/National	Eastern/Western Slovenia
BELOKRANJSKI MUZEJ METLIKA	Bela Krajina Museum Metlika	Local	East
CENTER SODOBNIH UMETNOSTI CELJE	Centre for Contemporary Arts Celje	Local	East
DOLENJSKI MUZEJ NOVO MESTO	Dolenjska Museum Novo Mesto	Local	East
GALERIJA AVGUSTA ČERNIGOJA	Avgust Černigoj Gallery	National	West
GALERIJA BOŽIDAR JAKAC	Božidar Jakac Art Museum	Local	East
GALERIJA MURSKA SOBOTA	Murska Sobota Gallery	Local	East
GALERIJA PREŠERNOVIH NAGRAJENCEV KRANJ	Fine Arts Gallery of Prešeren Award Winners Kranj	Local	West
GALERIJA VELENJE	Velenje Gallery	Local	East
GORENJSKI MUZEJ KRANJ	Gorenjska Museum Kranj	Local	West
GORNJESAVSKI MUZEJ JESENICE	Upper Sava Valley Museum Jesenice	Local	West
GRAD BOGENŠPERK	Bogensperk castle	Local	West
KOBARIŠKI MUZEJ	The Kobarid Museum	Local	West
KOROŠKI POKRAJINSKI MUZEJ	Carinthian Regional Museum	Local	East
KOZJANSKI PARK	The Kozjansko Regional Park	National	East
LOŠKI MUZEJ ŠKOFJA LOKA	Škofja Loka Museum	Local	West
LUTKOVNI MUZEJ	Museum of Puppetry	Local	West
MEDNARODNI GRAFIČNI LIKOVNI CENTER	International Centre of Graphic Arts	Local	West
MESTNA GALERIJA NOVA GORICA	City Gallery of Nova Gorica	Local	West
MESTNI MUZEJ IDRIJA	Idrija Municipal Museum	Local	West
MESTNI MUZEJ LITIJA	Litija Municipial Museum	Local	East
MODERNA GALERIJA	Museum of Modern Art	National	West
MUZEJ IN GALERIJE MESTA LJUBLJANE	The Museum and Galleries of Ljubljana	Local	West
MUZEJ KRŠČANSTVA NA SLOVENSKEM	Slovene Museum of Christianity	National	West
MUZEJ NOVEJŠE ZGODOVINE CELJE	Museum of recent history Celje	Local	East

Slovenian name	English translation	Local/National	Eastern/Western Slovenia
MUZEJ NOVEJŠE ZGODOVINE SLOVENIJE	National Museum of Contemporary History	National	West
MUZEJ ŠPORTA	Museum of Sports	National	West
MUZEJ VELENJE	Velenje Museum	Local	East
MUZEJ VRBOVEC - MUZEJ GOZDARSTVA IN LESARSTVA	Vrbovec Museum – Museum of Forestry and Timber Industry	Local	East
MUZEJ ZA ARHITEKTURO IN OBLIKOVANJE	Museum of architecture and design	National	West
MUZEJ ŽELEZNIKI	Železniki Museum (Public Institution of Ratitovec)	Local	West
MUZEJI RADOVLJIŠKE OBČINE	Radovljica Municipality Museums	Local	West
NARODNA GALERIJA	National Gallery of Slovenia	National	West
NARODNI MUZEJ SLOVENIJE	National Museum of Slovenia	National	West
NOTRANJSKI MUZEJ	Notranjska Museum Postojna	Local	East
OBALNE GALERIJE PIRAN	Piran Coastal Galleries	Local	West
PILONOVA GALERIJA AJDOVŠČINA	Pilon Gallery Ajdovščina	Local	West
PIVOVARSKI MUZEJ LJUBLJANA	The Brewery Museum Ljubljana	Local	West
POKRAJINSKI MUZEJ CELJE	The Celje Regional Museum	Local	East
POKRAJINSKI MUZEJ KOČEVJE	Regional Museum Kočevje	Local	East
POKRAJINSKI MUZEJ KOPER	Koper Regional Museum	Local	West
POKRAJINSKI MUZEJ MARIBOR	Maribor Regional Museum	Local	East
POKRAJINSKI MUZEJ PTUJ ORMOŽ (PMPO)	Ptuj-Ormož Regional Museum	Local	East
POMURSKI MUZEJ MURSKA SOBOTA	Pomurje Museum Murska Sobota	Local	East
POSAVSKI MUZEJ BREŽICE	Museum of Posavje Region in Brežice	Local	East
PRIRODOSLOVNI MUZEJ SLOVENIJE	The Slovenian Museum of Natural History	National	West
ROKODELSKI CENTER RIBNICA	Ribnica Handicraft Centre	Local	East
SLOVENSKA KINOTEKA	Slovenian Cinematheque	National	West
SLOVENSKI ETNOGRAFSKI MUZEJ	Slovene Ethnographic Museum	National	West
SLOVENSKI GASILSKI MUZEJ BRANKA BOŽIČA	Slovenian Fire-Fighter's Museum of dr. Branko Božič	Local	East

Slovenian name	English translation	Local/National	Eastern/Western Slovenia
SLOVENSKI GLEDALIŠKI MUZEJ	Slovenian Theatre Museum	National	West
SLOVENSKI ŠOLSKI MUZEJ	Slovenian School Museum	National	West
SPLOŠNA KNJIŽNICA LJUTOMER	Ljutomer General Library	Local	East
TEHNIŠKI MUZEJ SLOVENIJE	Technical Museum of Slovenia	National	West
TOLMINSKI MUZEJ	Tolmin Museum	Local	West
TRUBARJEVA DOMAČIJA	Trubar Homestead	Local	West
TRŽIŠKI MUZEJ	Tržič Museum	Local	West
UMETNOSTNA GALERIJA MARIBOR	Maribor Art Gallery	Local	East
VOJAŠKI MUZEJ SLOVENSKE VOJSKE	Military Museum of Slovenian Armed Forces	National	East
VOJAŠKI MUZEJ TABOR LOKEV	Lokev Military museum	Local	West
ZASAVSKI MUZEJ TRBOVLJE	Zasavje Museum of Trbovlje	Local	East
ZEMLJEPISNI MUZEJ	Geographical Museum	National	West