Caring for collections in tropical environments: collecting and communicating data at Museu Paulista/USP, Brasil (1997-2000)[1]

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Introduction

The environmental data recorded since 1997 at Museu Paulista, Universidade de São Paulo, Brazil, is part of the "Museum Environmental Plan", a research project begun in 1996 and still in progress. The plan has as main objectives:

- to improve understanding the museum environmental conditions;
- to research, learn and compare the environmental conditions inside and outside the building;
- to develope a simple way of presenting this data so it could be used by all museum staff, researchers in general, graduate students and museums inside or outside Brazil;
- to help the museum staff plan their activities;
- to manage the collections preservation by studying each area individually, proposing changes when necessary;
- to contribute with other institutions by divulging our experience, problems and solutions;
- to contribute with the study of collections management in tropical countries[2].

The museum and the city of São Paulo

Museu Paulista da Universidade de São Paulo is known all over Brazil as the "Independence Museum". It is one of the most visited sites in the country and one of São Paulo's largest museums. The *Museu Paulista*, which is one of the four

1.This project would not exist without the hard work of Christine May Kauffmann Fidalgo (graphic designer,*Museu Paulista*); Alexandre Henrique da Silva (gradua-tion student scholar 2001-2003, author of *Cartas Climáticas);* Lincoln Seiji Tejima (graduation student scholar 2000-2001 author of *Plantas temáticas*) ; Dinah Eastop (The Textile Conservation Centre, University of Southampton, UK) and Prof. Dr. Tarik Rezende de Azevedo from the *Laboratório de Climatologia e Biogeografia do Departamento de Geografia da FFLCH/USP* – who joined the project in 2002.

2. All the equipment described was sponsored by FAPESP, *Fundação de Amparo à Pesquisa do Estado de São Paulo*.

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museums of the University of São Paulo[3], is a social history museum located inside a park (FIGURE 1). The park has three different sections: the Independence group of statues, the French garden and fountain, all in the front side, and the grove at the back. The building that houses the museum is a 19th century neoclassical construction with open terraces and large halls (FIGURES 2-4).

When entering the museum one notices, almost immediately, that the environmental conditions outside and inside the building seem to be very similar: large open doors, open halls and corridors suggest there are no barriers from the outside climate, especially during rainy seasons, and indicates, as a first consideration, very improper conditions for the preservation of the museum's collections. Since the building is itself a monument and that means, in Brazil, that it cannot be altered, the comprehension of the environmental conditions was considered crucial. This project was conceived to investigate those conditions and highlight the differences, if existent, among the 33 areas monitored.

3. The other museums of the Universidade de São Paulo are: MAC – *Museu de Arte Contemporânea*, MAE – *Museu de Arqueologia e Etnologia* and MZ – *Museu de Zoologia*.

FIGURE 1 – Museu Paulista, front view showing the french garden and fountain. Photo by José Rosael.

São Paulo, the third most populated city in the world, is located just by the Capricorn Line, on the "Planalto Atlântico", 700m above sea level and 45 km far from the Atlantic Ocean. Today its 16 million inhabitants share an area of 1.747 Km^2 in which 3 million vehicles generate 6.000 tons of pollutants every day. The study of São Paulo's climate conditions was considered essential to understand what happens inside the museum during the different seasons of the year. The bibliography available, however, indicated considerable diferences when analising environmental data of the city. An essay – based on that bibliography and on data reports provided by three different climate centres – was produced, balancing all information and considering only part of the data available[4]. Ipiranga – the area where the museum is located, presents a very peculiar climate if compared with other zones of the city of São Paulo: despite the park and the green areas existent, higher temperatures, weak winds, improper conditions for pollutants dispersion and very high concentration of population are some of its specific characteristics (FIGURE 5).

4. The essay was produced by Lincoln Seiji.Teshima "*O meio físico da cidade de São Paulo*", 2001 ; unpublished.

FIGURE 2 – General view from museum area with building in the back. Photo by José Rosael.

FIGURE 3 – Museu Paulista entrance and main hall. Photo by José Rosael.

FIGURE 4 – Main halls and stairs (left side). Photo by José Rosael.

FIGURE 5 – Open halls on gallery west. Photo by José Rosael.

FIGURE 6 – Archive and storage for photographs. Photo by José Rosael.

Recording relative humidity and temperature data

The places monitored during those four years included six storage facilities, the main entrance hall, the central stairs and all exhibition rooms including corridors. All rooms were monitored by RatonaÒ thermohygrographers. Since the museum had bought two units of that equipment in the previous years and considering that in 1996, when planning began, dataloggers were not easily available in Brazil, it was decided to invest in more units of the same equipment rather than move to a different supply. One of the advantages considered when choosing termohygrographers was their "visibility": the data recorded would be visible to both staff and visitors. At that time the staff had to be convinced about the importance of putting the equipment in the rooms and the staff members were invited to cooperate with the project. Before long the data originated by the thermohygrografers started to be observed and compared by staff and also by visitors. Considering that *Museu Paulista* was one of the first museums in São Paulo to monitor collections in a large scale it was crucial that the staff and the public understood what was being done. The security staff started to take care of the equipment and ask frequently for details to better inform the visitors.

The particular problems the project had to be worried about during the four years were: the renewal works on the building; the several changes in

the exhibition rooms and the security of the equipment itself. From 1995 to 2000 the building was completely restored without the need of closing the museum to visitors. To make this possible exhibitions had to be held in turns, some rooms had to be closed while others were under work. It should be mentioned that firstly, restoration plans did not include the exhibition areas, so the risk of equipment and information accuracy were not considered when elaborating the environmental project. The termohygrographers always stayed in place, protected, except for one that invariably followed the coins and medals collections. The changes in the rooms were all recorded and will be considered in all future investigations.

5. The author means that examples of similar classifications in other museums with tropical environments were not found. Stefan Michalski's article "A discussion of correct/incorrect values." published in ICOM-CC 10th Triennial Meeting Preprints was crucial for establishing those levels.

The environmental plans (plantas temáticas)

The relative humidity and temperature data recorded during these four years offers us an important opportunity to analise and understand the impact of those factors in museum collections, and may suggest, also, that museums situated in tropical environments should consider other values when discussing and evaluating their environmental conditions. However, all the information obtained would be useless if museum staff, researchers in general, graduate students and even the general public could not make use of it. Communication was always considered crucial; one of the main issues of the project was to provide information to help the museum staff plan their activities. During the first two years all data was transfered to an Excel® program that produced graphs for each one of the rooms. The understanding of the data and the graphs, however, was considered inadequate and confusing by the staff. Links between the graphs and people's working experiences had to be made clear.

To make all the records easily comprehensible to the museum staff, environmental plans were created. Adapting the museum plans and basing the work on geography, physics and architectural patterns, the environmental plans *(plantas temáticas)* were developed with the use of a CorelDRAW 9® program. The main criterion used to design the plans was the staff's comprehension. It was crucial that the plans could be easily assimilated and used without the assistance from a conservator.

The most difficult part when elaborating the plans was establishing diverse levels for relative humidity and temperature data. At the *Museu Paulista* relative humidity levels recorded varied from under 30% up to 98 % , and temperatures from 12°C to 35°C approximately. What ranges should be classified as improper ones? What range would be considered "proper"? No references about similar classifications were found in the bibliography[5]. Decisions had to be made and it was decided that levels of relative humidity lower than 50% and higher than 80% would be considered improper; in between, two other levels were created. The 50-69% level was considered "proper" or the "good level" and the 70-80% level was considered acceptable. Four different shades of blue were used to indicate the four different levels in the plans. Since relative humidity data should be accentuated more than temperature information, RH numbers were located inside the plan while temperature numbers were positioned inside small bars.

Concerning the temperature, three levels were named: "the proper or the good temperature level" until 24°C; the "bad level" comprising level data between 25°C and 28°C and a "very bad level" including temperatures higher than 28°C. Three different colours were used to indicate the levels: yellow, orange and red. The author never felt comfortable about those classifications but it was assumed that distinctions should be made to the users of the environmental plans. Above all, the plans should point out to the staff which museum areas were better from the conservation point of view, and which ones needed more attention.

After some changes the plans were finally submited for te museum staff's evaluation and, since results were considered very successful, a total of 48 plans – one for each month of 1997, 1998, 1999 and 2000 - were produced. Recently, two museum activities envolving collections have already planned their actions based on the environmental plans.

The author, besides having all the plans published here, intends to make them available on the web. Many small museums of Brazil have already inquired *Museu Paulista* about those environmental plans; the possibility of developing simple and low cost environmental studies is always mentioned as the main interest. Seminars about environmental studies in tropical climates to museum staff and the general public demonstrate a growing interest in the subject, probably due to the lack of information available in Portuguese and in outside conservation literature.

Understanding the records

Instability in relative humidity and temperature is expected in tropical climates. In the case of São Paulo's climate, instability might mean, for example, changes in RH from 50% to 80% in few hours. What effects this instability has in the inside areas of the museum is what we want to determine from now on. The impact of these changes on museum objects, however, will not be discussed in the near future. Since the year 2000, the project was elected by the university training program to receive a two-year scholarship. That brought graduate students from the Geography course to work in the museum environmental project, substantially increasing the exchange of information.

The second part of the project – which commenced in 2002 – aims to evaluate the information recorded. Factors such as seasons of the year, climate phenomena like "El Niño" and "La Niña", ventilation on the different floors, direct contact with external areas, levels of insulation, distances from the park's vegetation and the park's fountain, direction of the winds, exposure to external pollution, amount of visitors and duration of their stay in the rooms, and the amount of hygroscopic materials in the rooms monitored, should be carefully considered.

Once communication was identified as the main issue, another type of plan started to be developed. *Carta Climática* an individual plan of each space monitored, in which, besides the RH and the temperature data, information like room´s dimensions and finishings, number of doors, windows etc, collections exposed, recent modifications, visitors's access, lighting and percentage of hygroscopic materials is shown together.

Conclusion

Brazil is a huge country and climate diversity is one of its characteristics. It is time for museums and research centres in the country to invest more deeply in environmental studies, but also to make conservation information simple and available to the museum community as a whole. Exchange of information and experiences, successful or not, should be stimulated. University museums like *Museu Paulista* can contribute to this exchange by not only divulging the data recorded but also developing, adapting and sharing simple conservation practices.

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Projeto de Monitoramento Ambiental
Plantas Temáticas e Fichas Técnicas Climáticas

Coordenação geral: Teresa Cristina Toledo de Paula

Criação dos primeiros gráficos em Excel[R]: Luciano A. Beraldo
Coleta e transferência de dados até 2000: Teresa Cristina Toledo de Paula

1. Plantas Temáticas – Microclimas do Museu Paulista

Projeto Gráfico:	Christine May Kaufmann Fidalgo
Concepção:	Lincoln Seiji Tejima
	Christine May Kaufmann Fidalgo
	Teresa Cristina Toledo de Paula
Execução e transferência de dados:	Lincoln Seiji Tejima (1997-1999)
	Alexandre Henrique da Silva (2000)
Assistência em informática:	Leandro Luiz dos Santos Regina
	Luciano A. Beraldo
	Tomas Adamavicius

2. Fichas Técnicas Climáticas

Projeto Gráfico:	Christine May Kaufmann Fidalgo
Concepção:	Alexandre Henrique da Silva
	Christine May Kaufmann Fidalgo
	Teresa Cristina Toledo de Paula
Execução e transferência de dados e imagens:	Alexandre Henrique da Silva
Fotografias:	Hélio Nobre
	José Rosael
Assistência em informática:	Leandro Luiz dos Santos Regina
	Luciano A. Beraldo
	Tomas Adamavicius

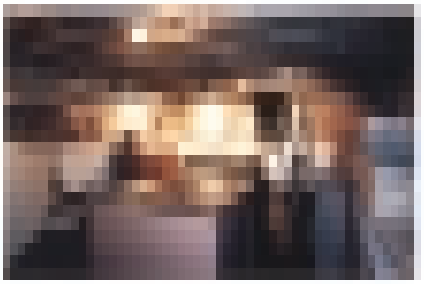
Observações:

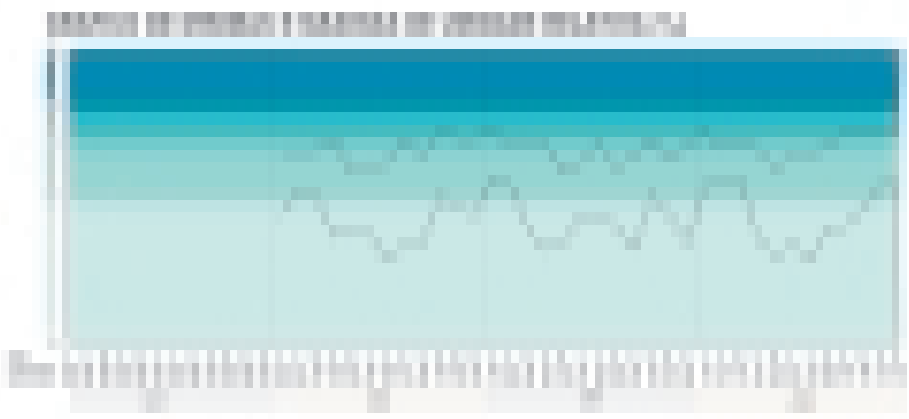
1. Nem todas as áreas estudadas começaram a ser monitoradas na mesma data;

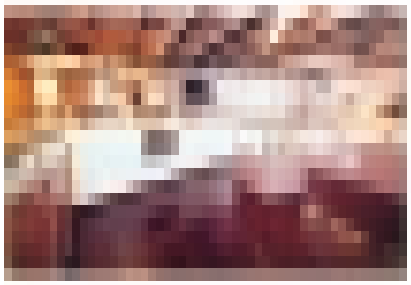
2. Algumas informações estão registradas apenas na primeira Planta Temática;

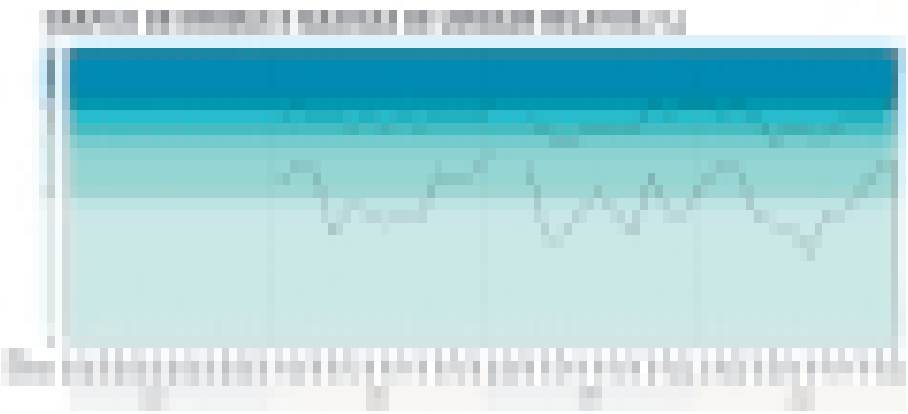
3. Não existe uma ficha técnica climática para a sala C-7 (fechada) embora ela tenha sido monitorada no período e conste nas Plantas Temáticas;

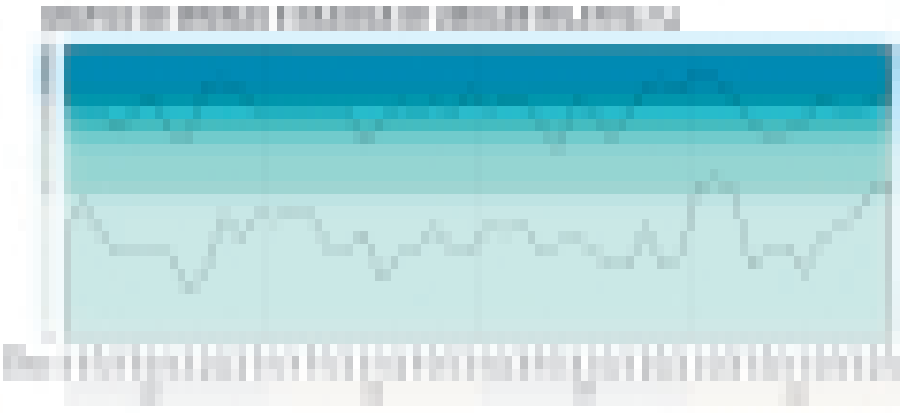
4. Todas as áreas com acervo, cujos responsáveis aderiram ao projeto, foram monitoradas.

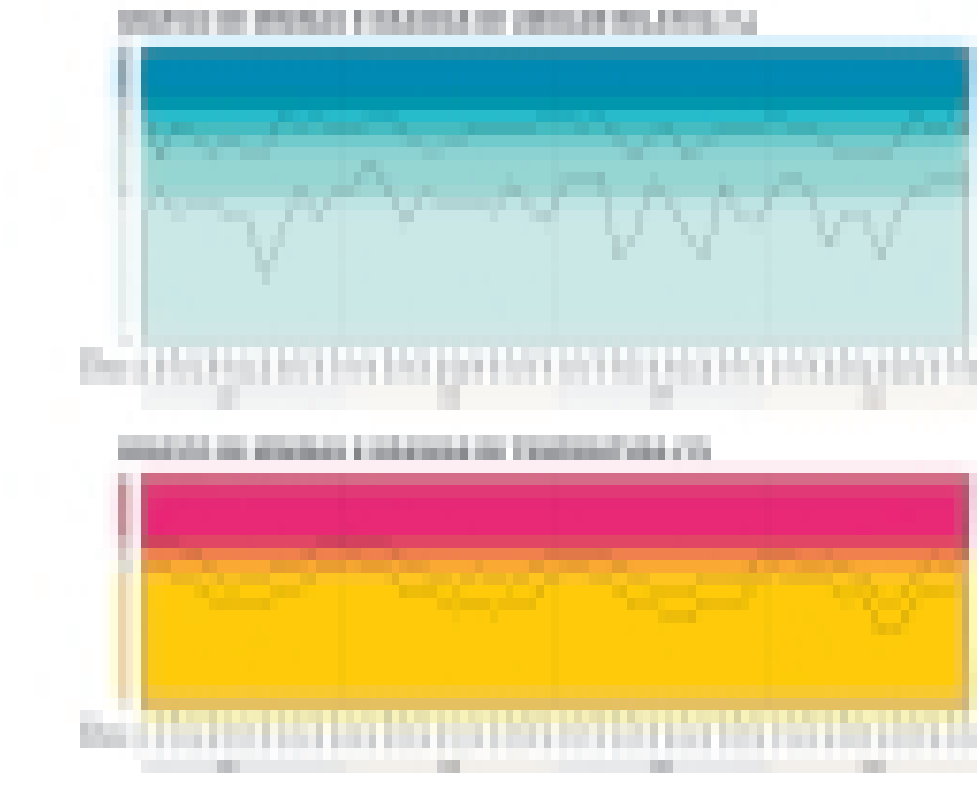


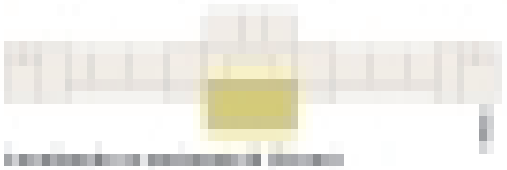


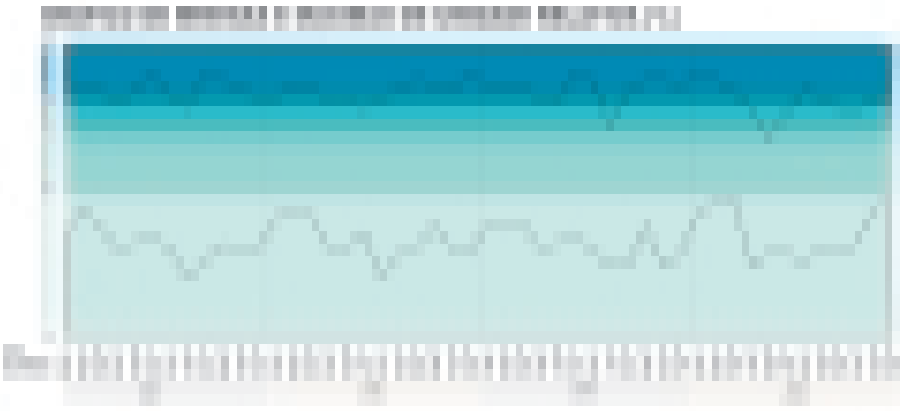


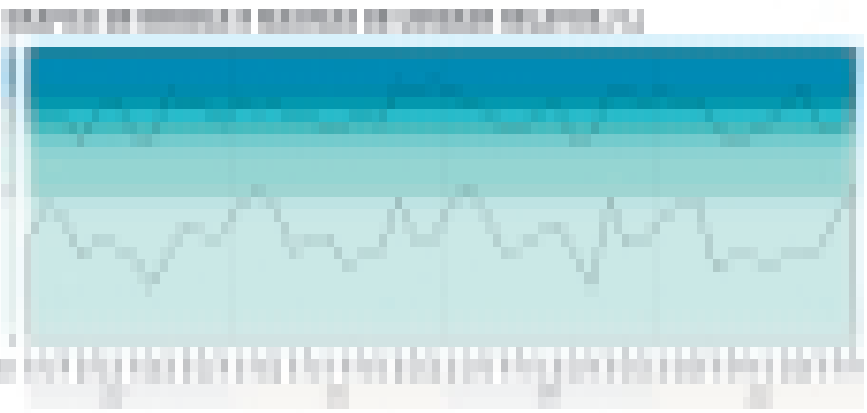


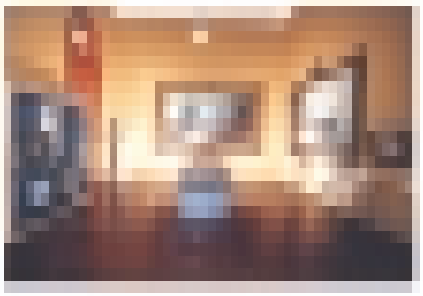


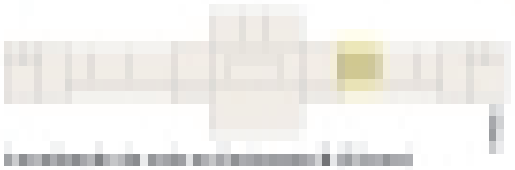


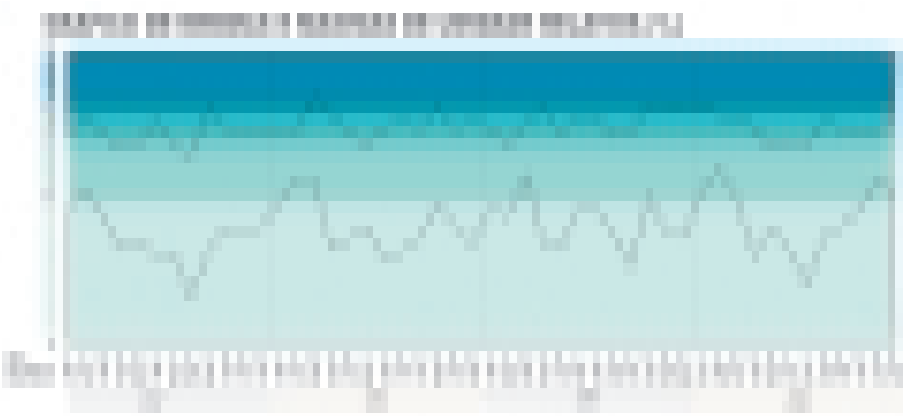


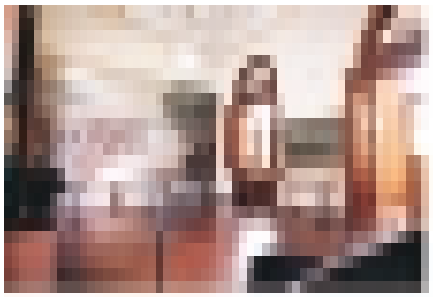


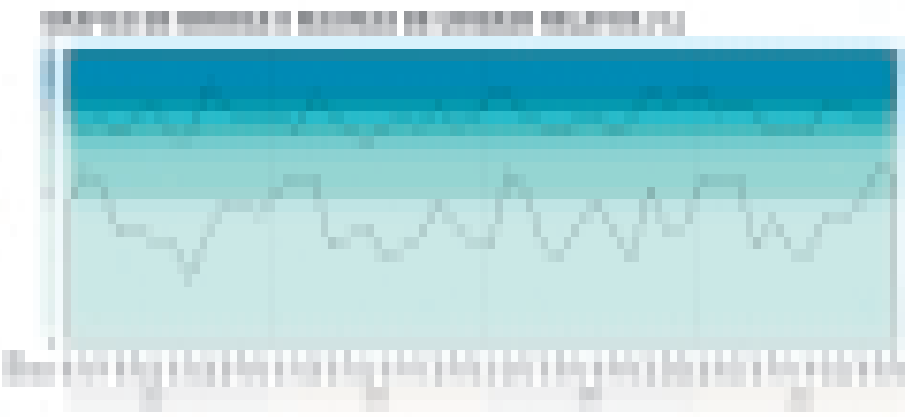


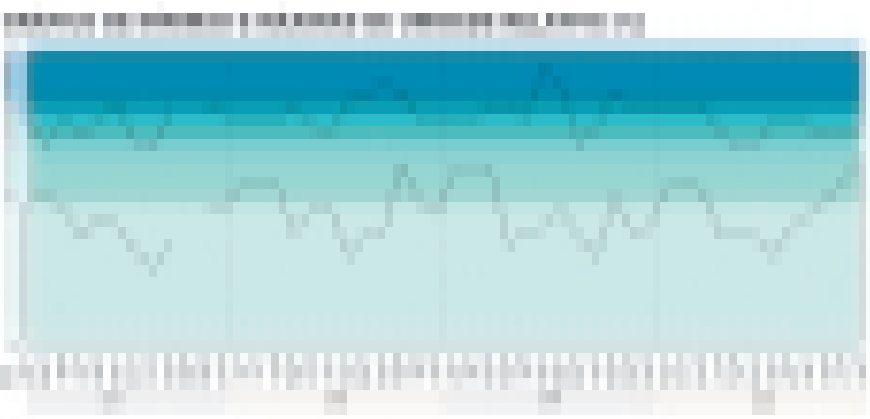


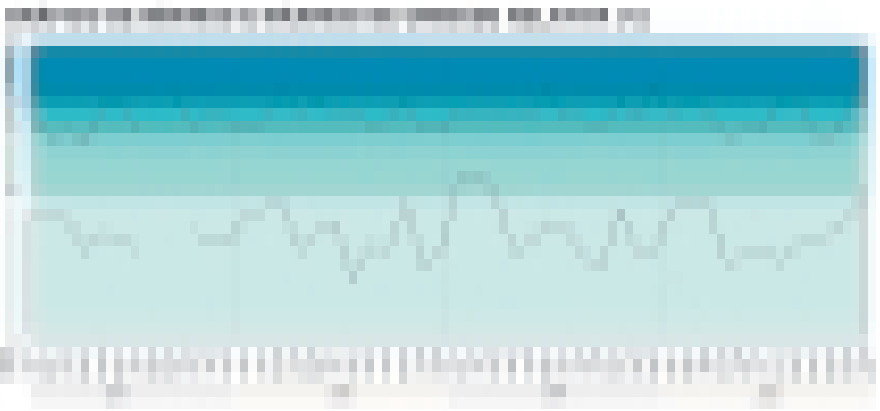


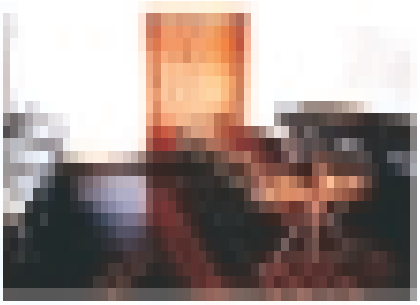


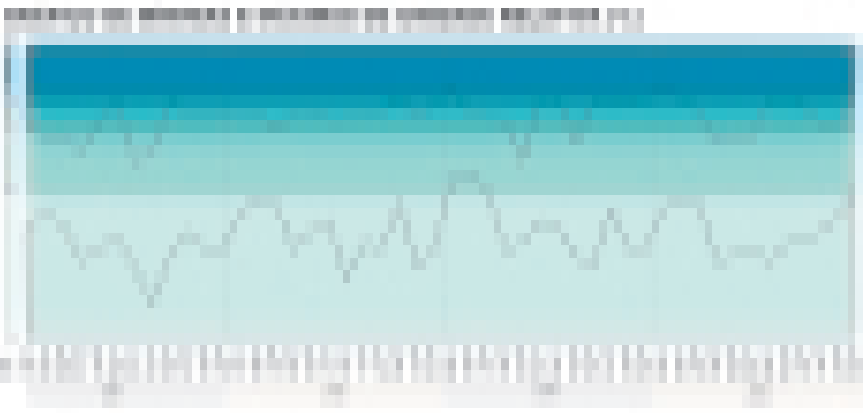


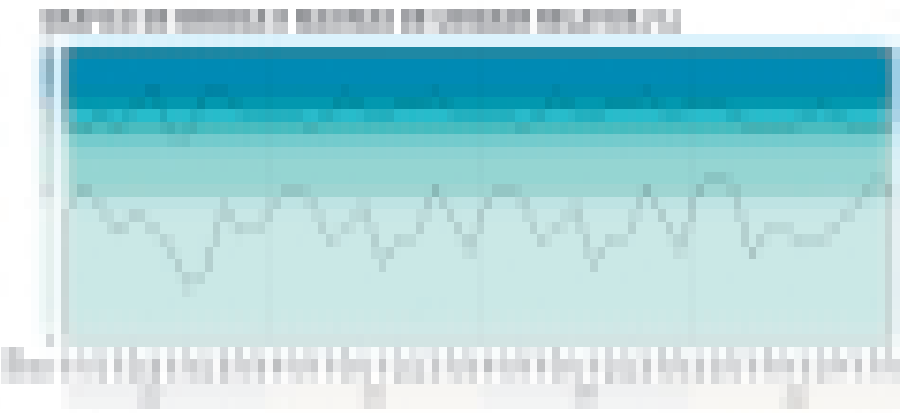


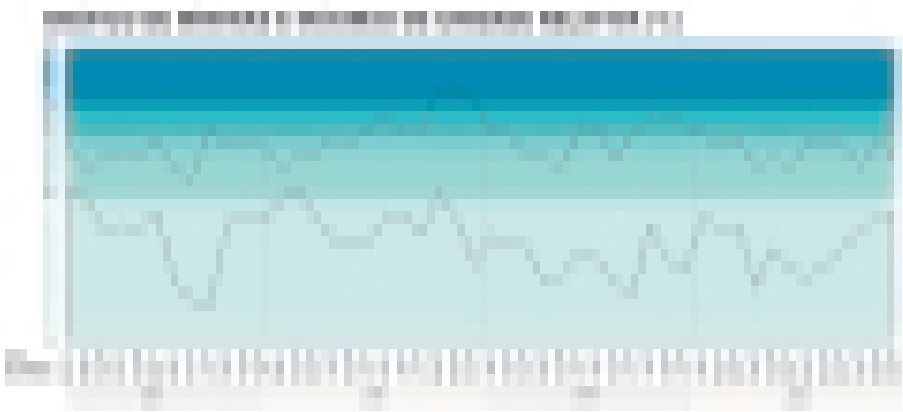


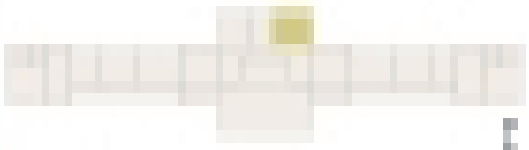


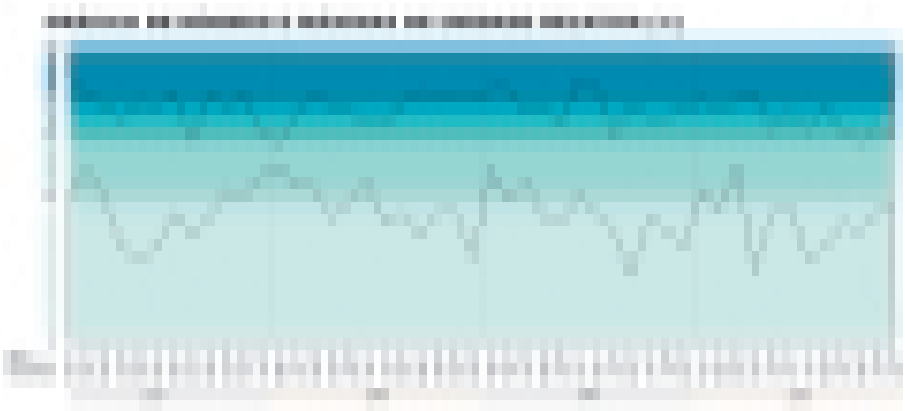


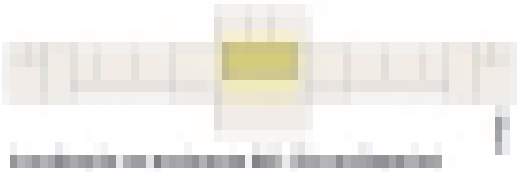


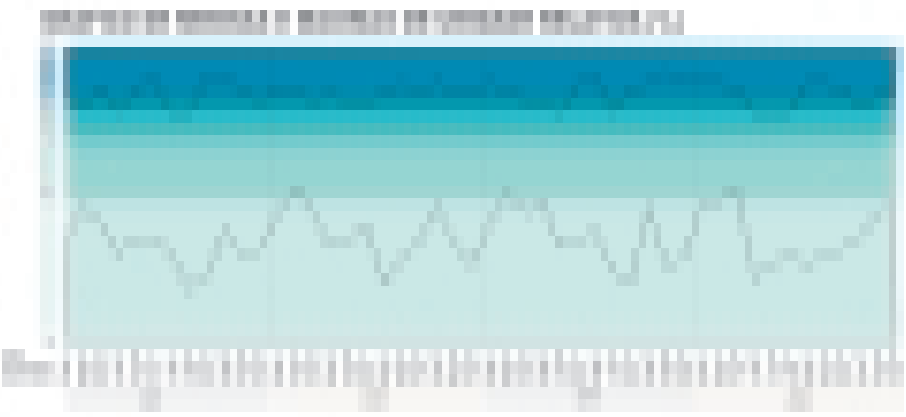


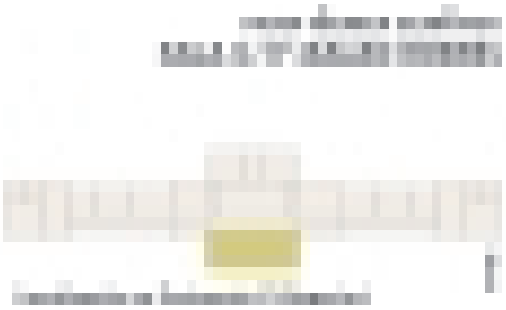


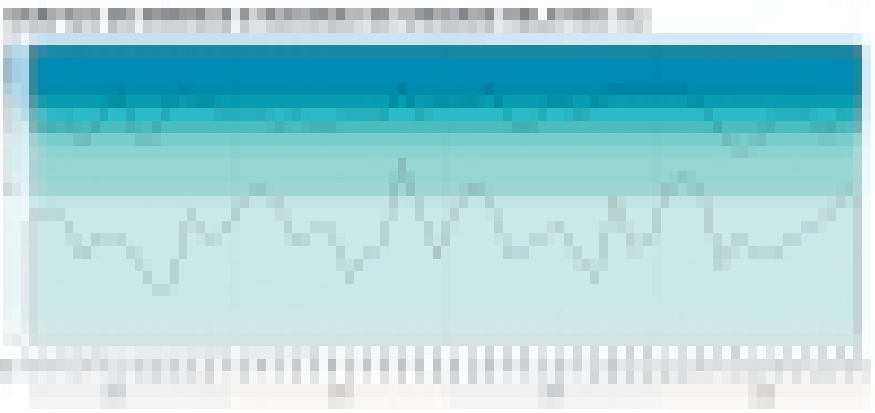


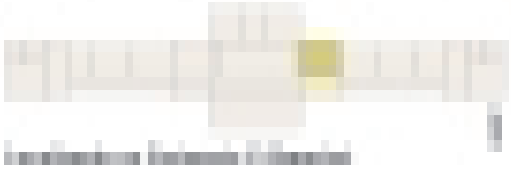


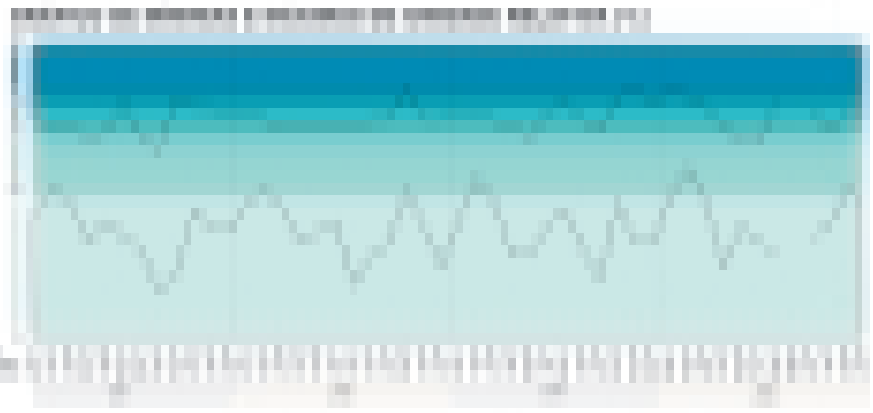


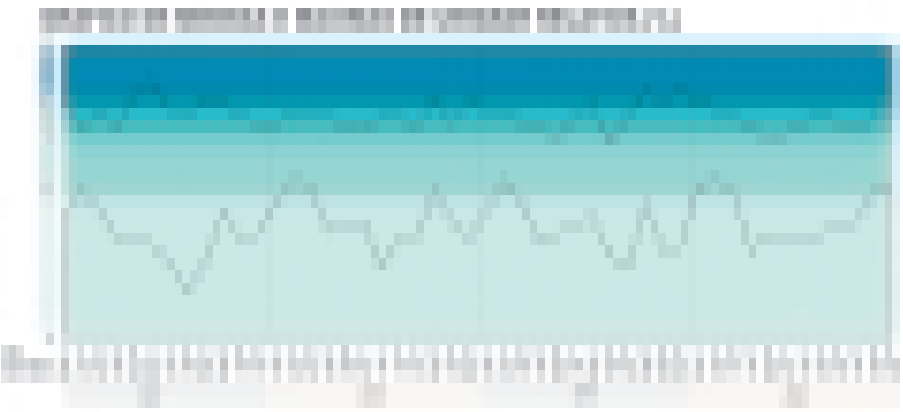


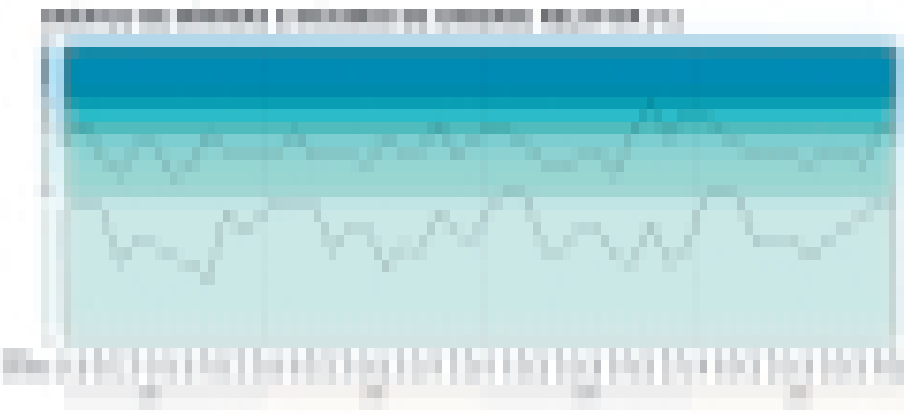


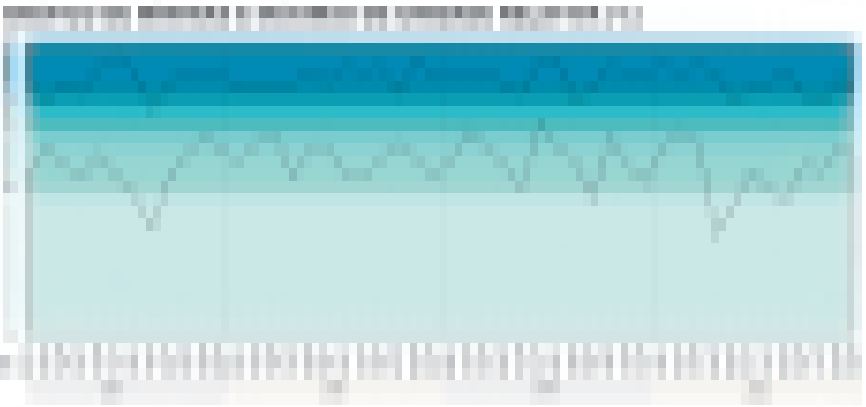


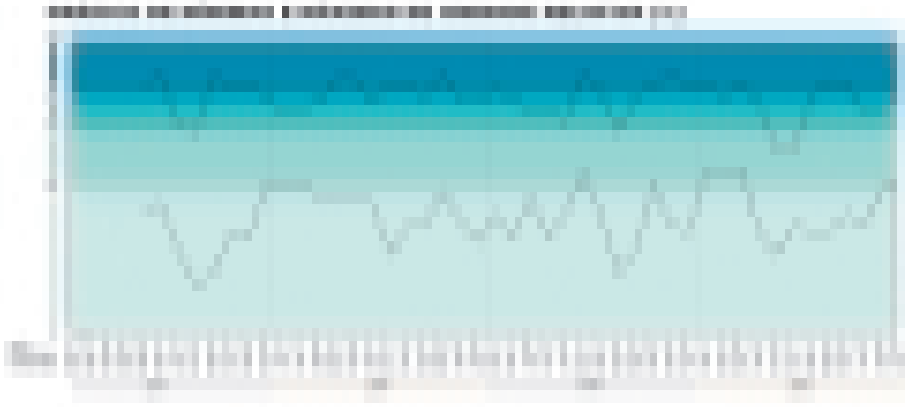


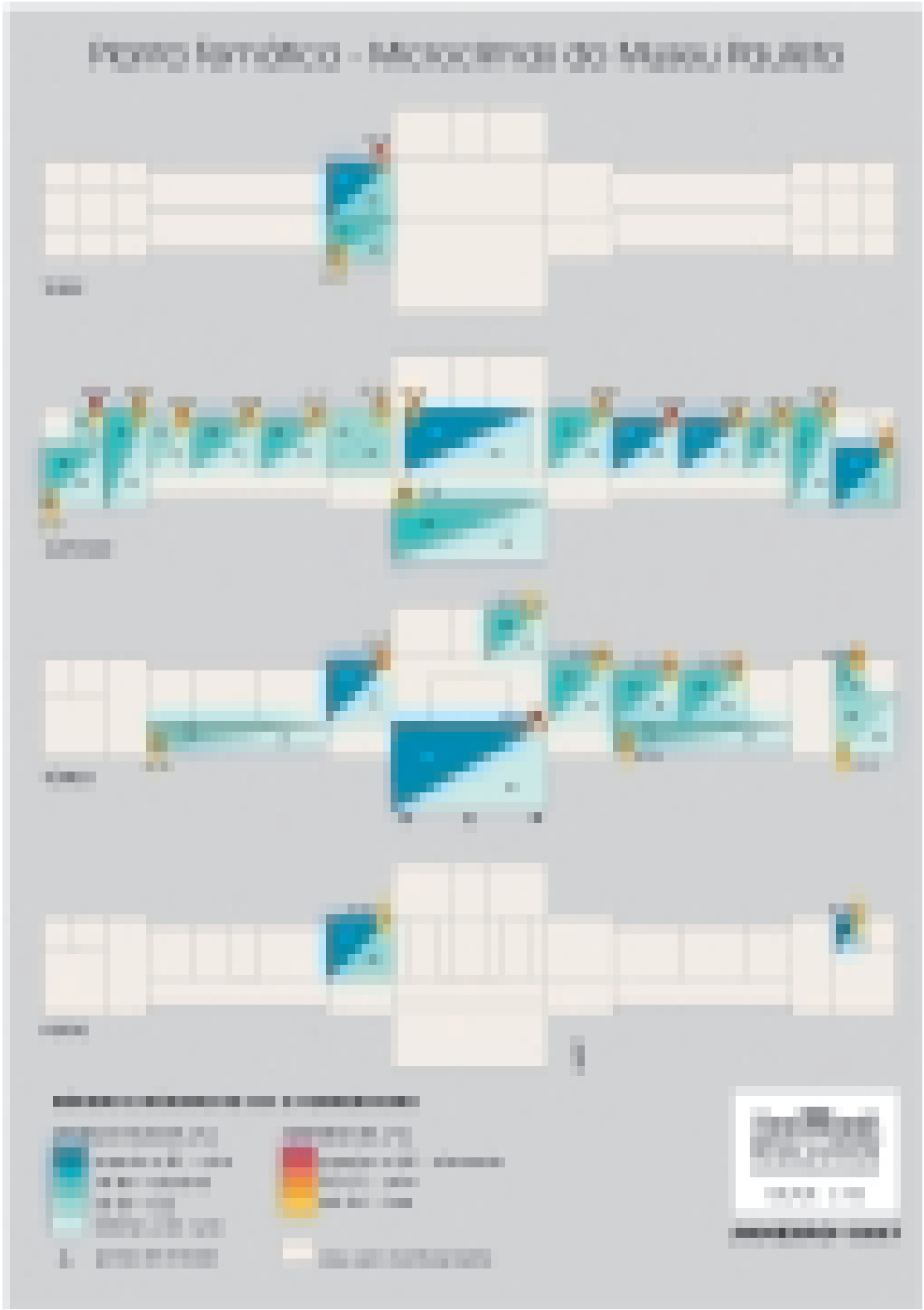


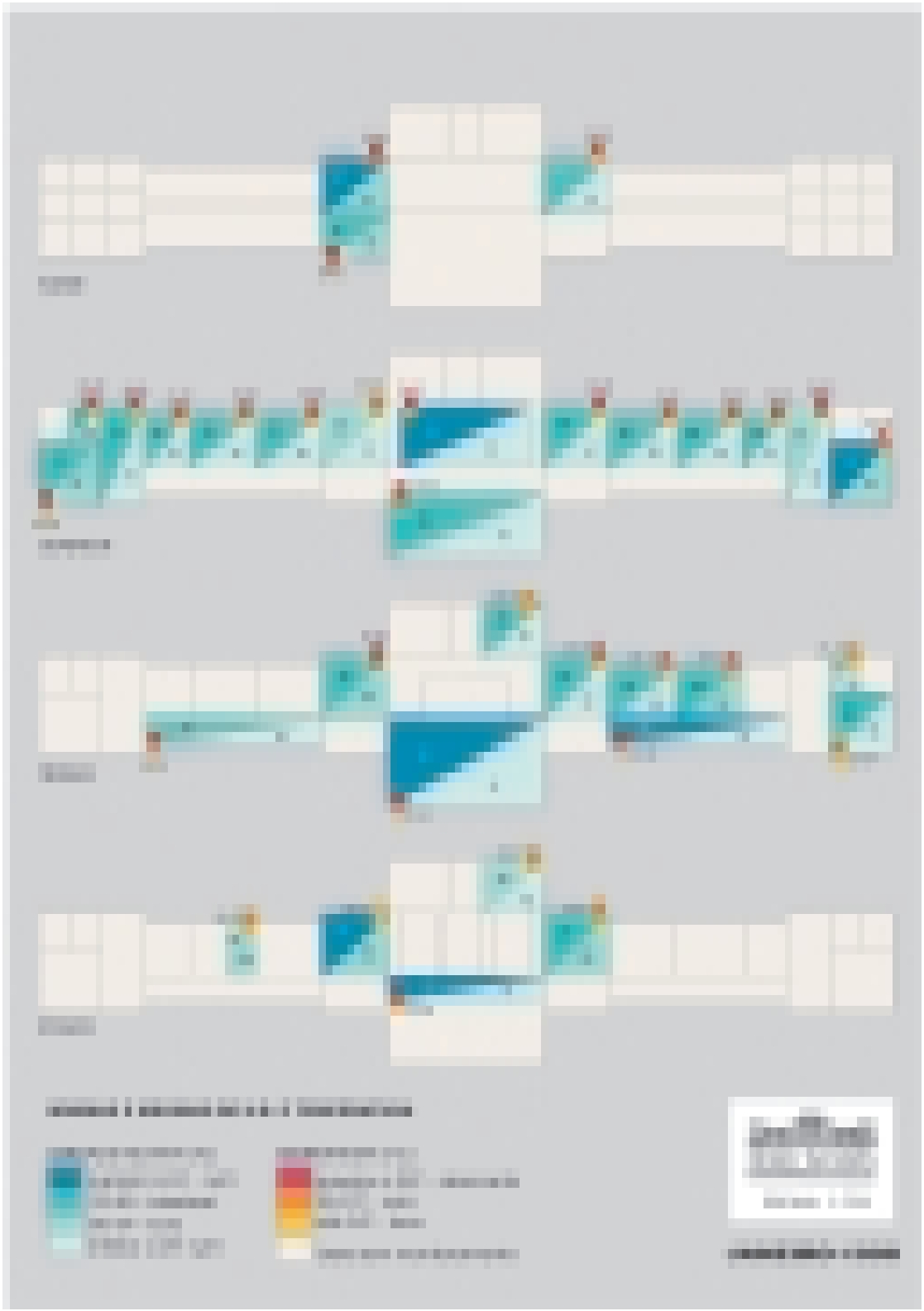


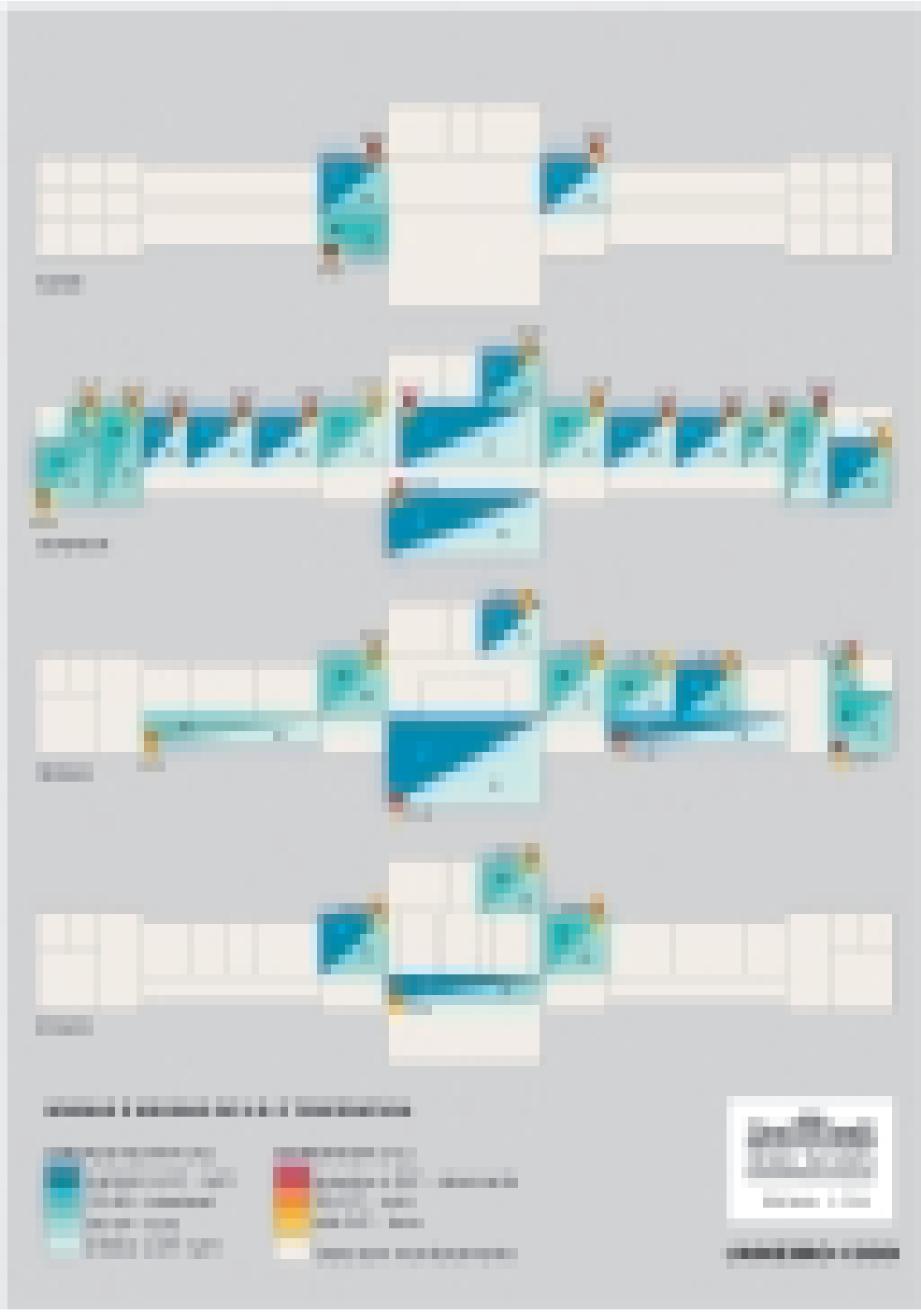


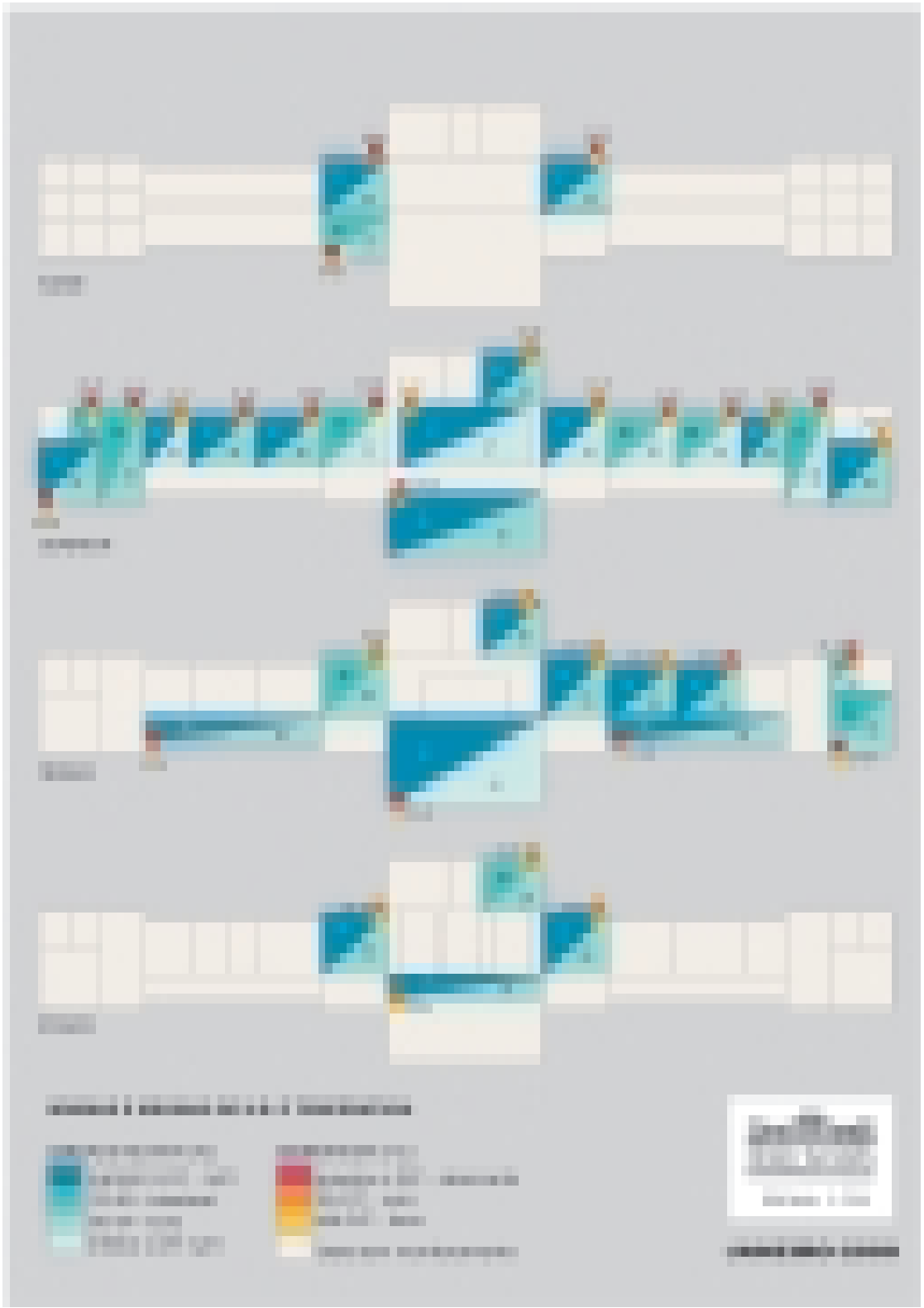


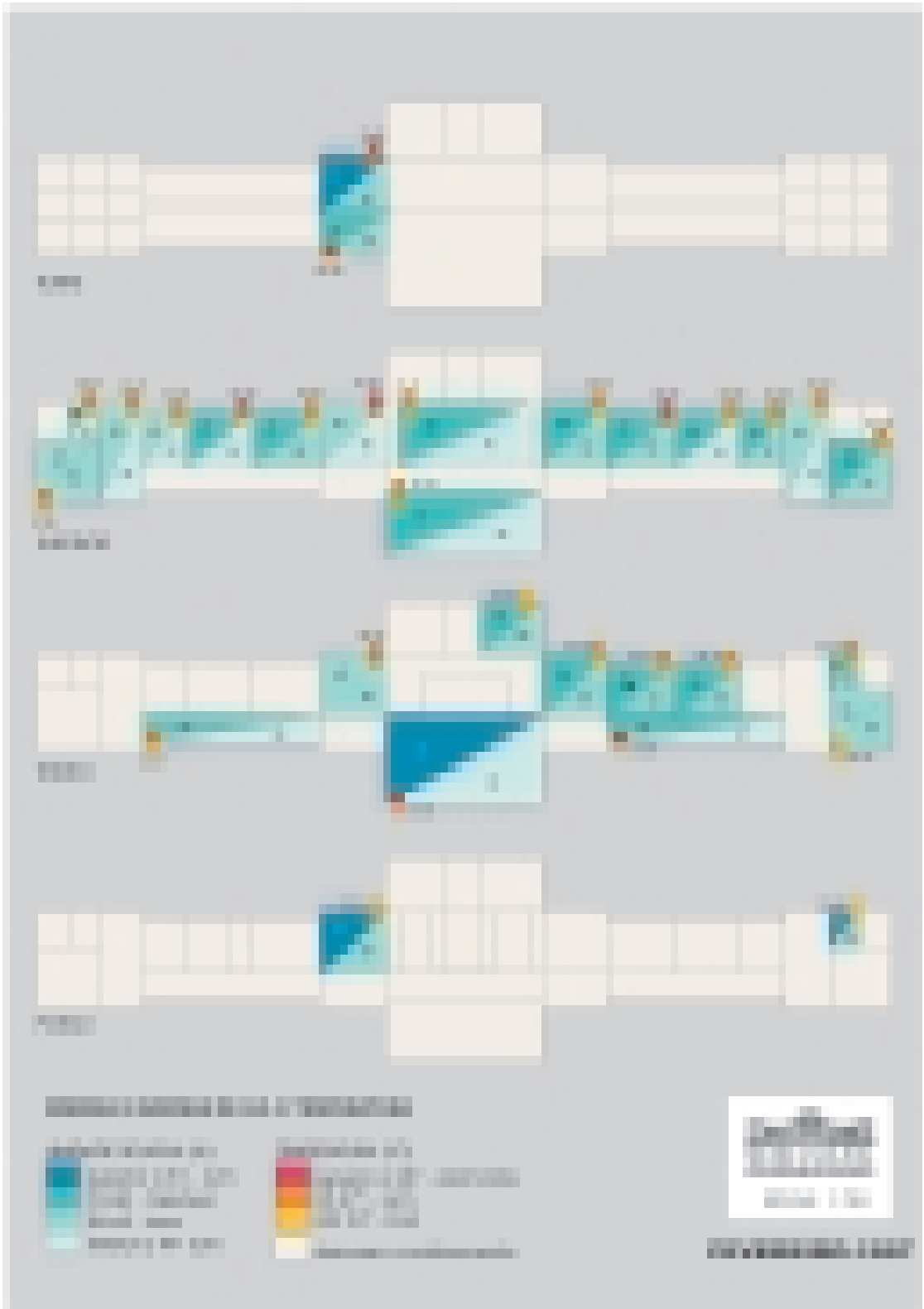


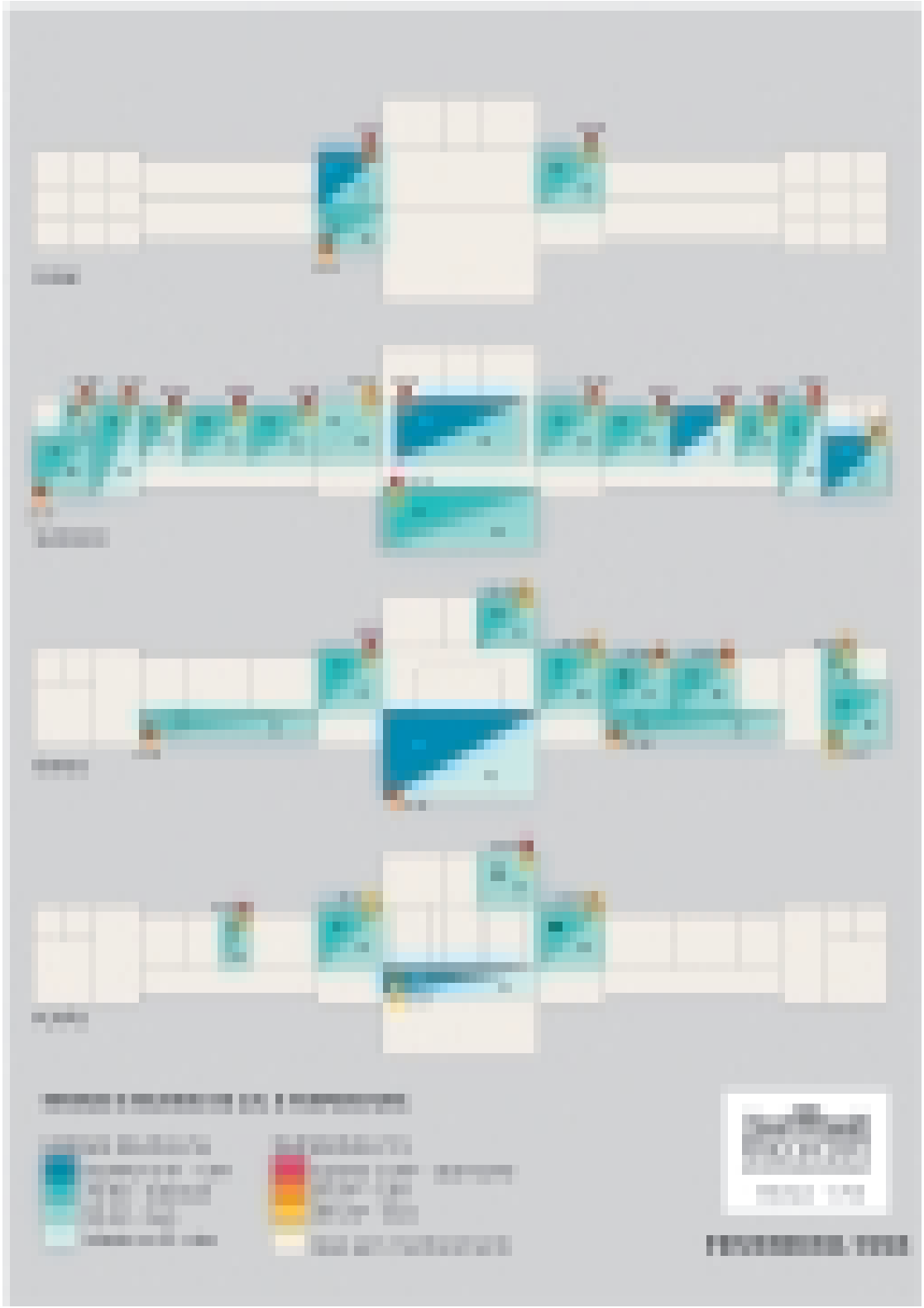


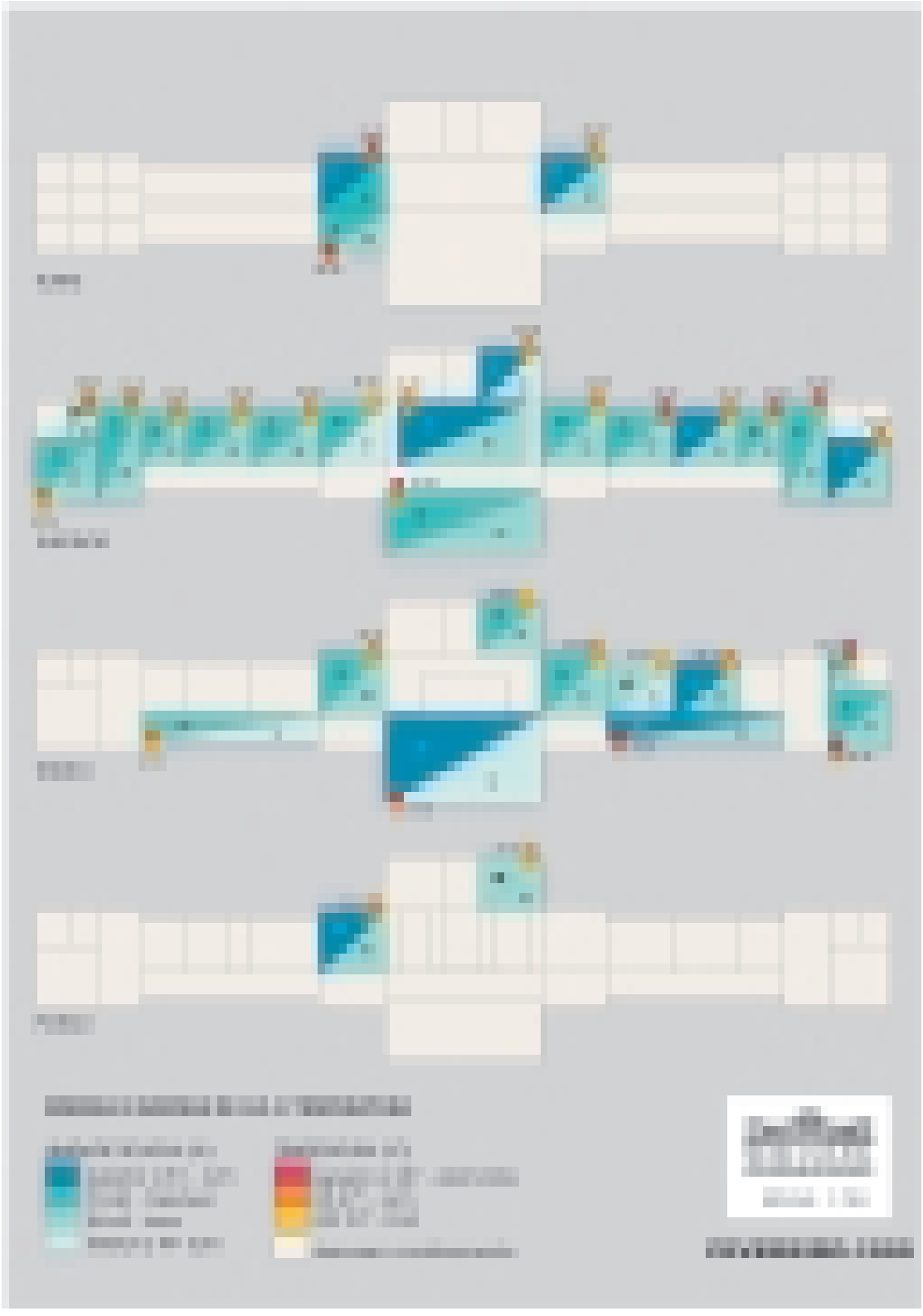


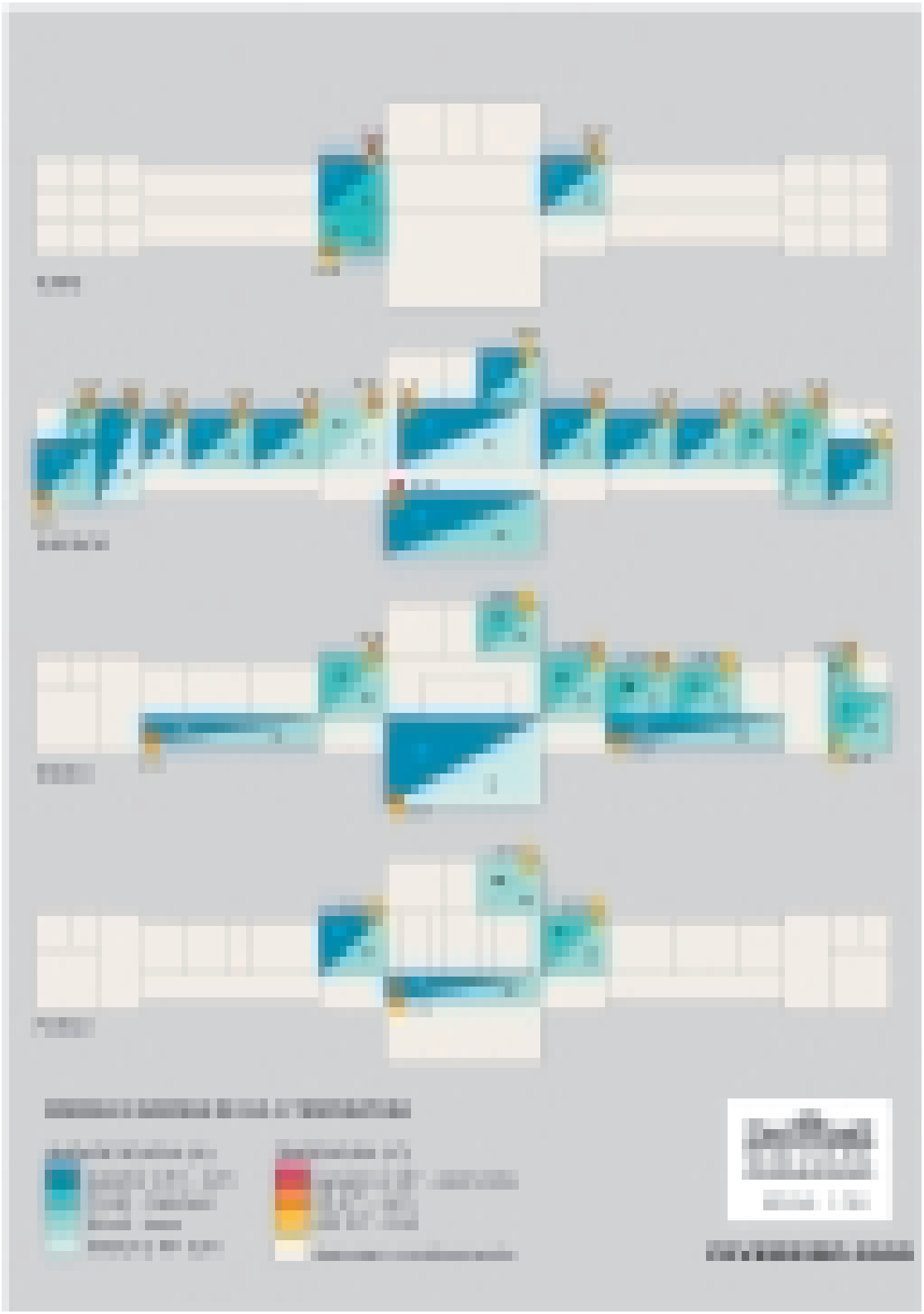


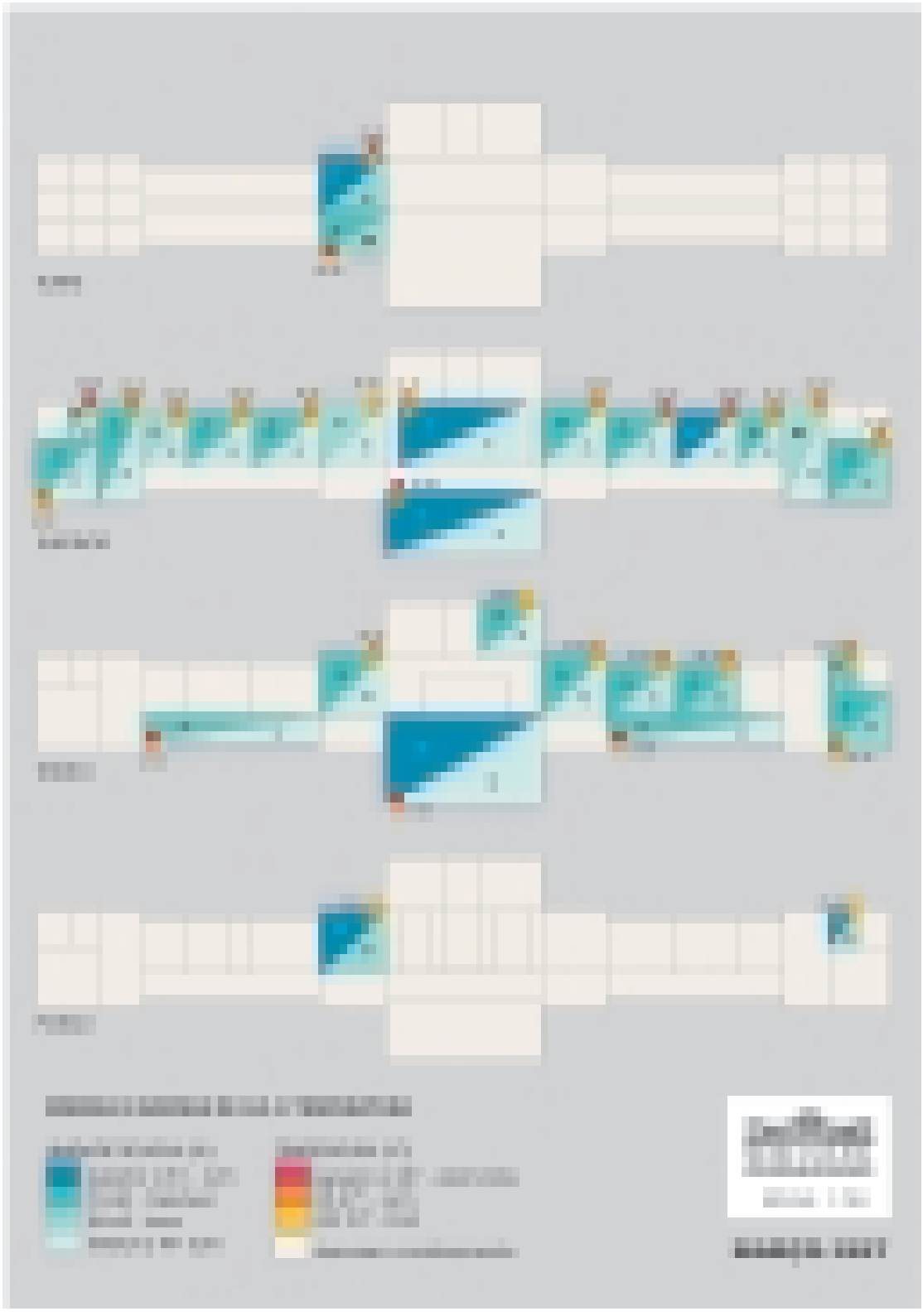


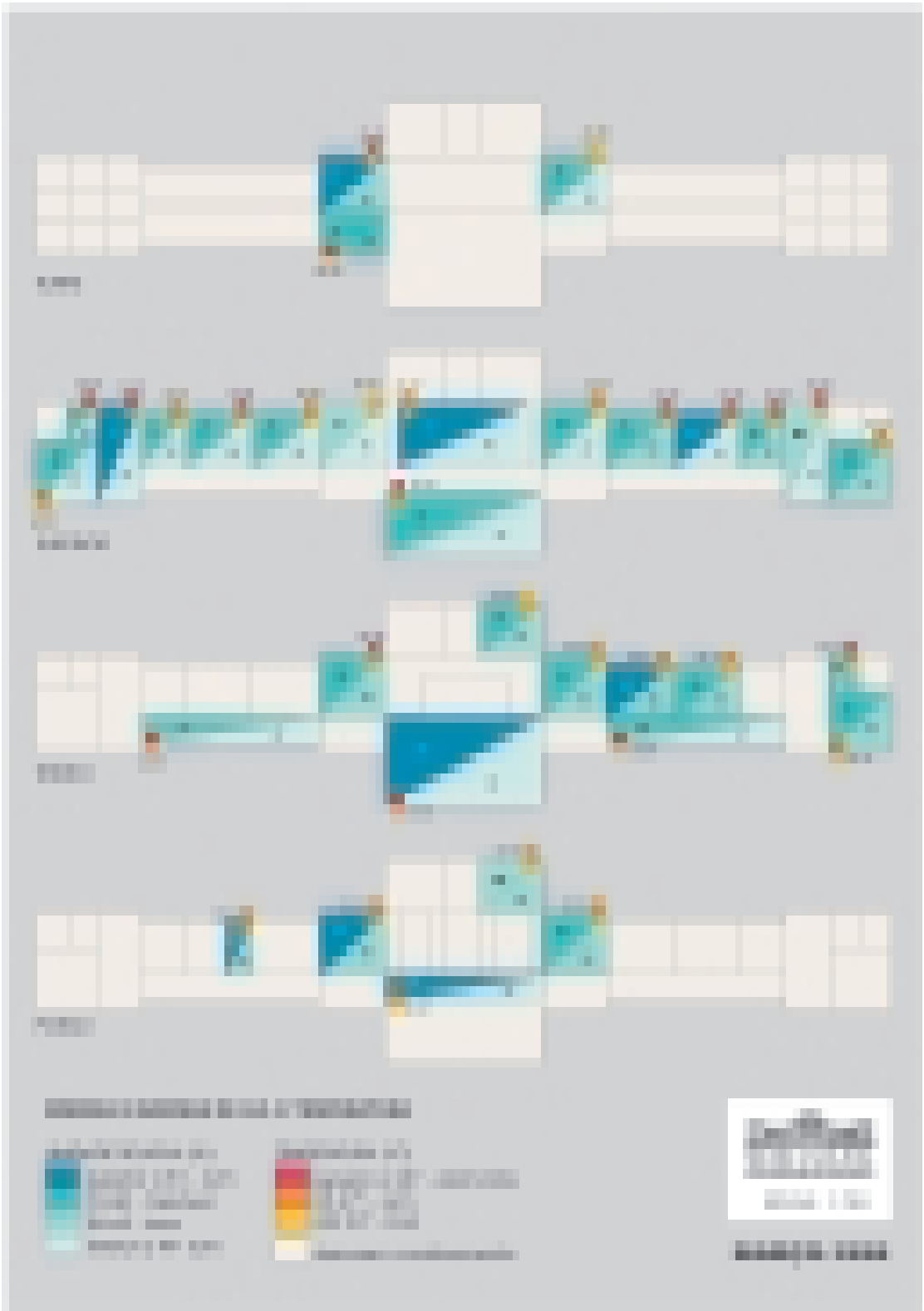


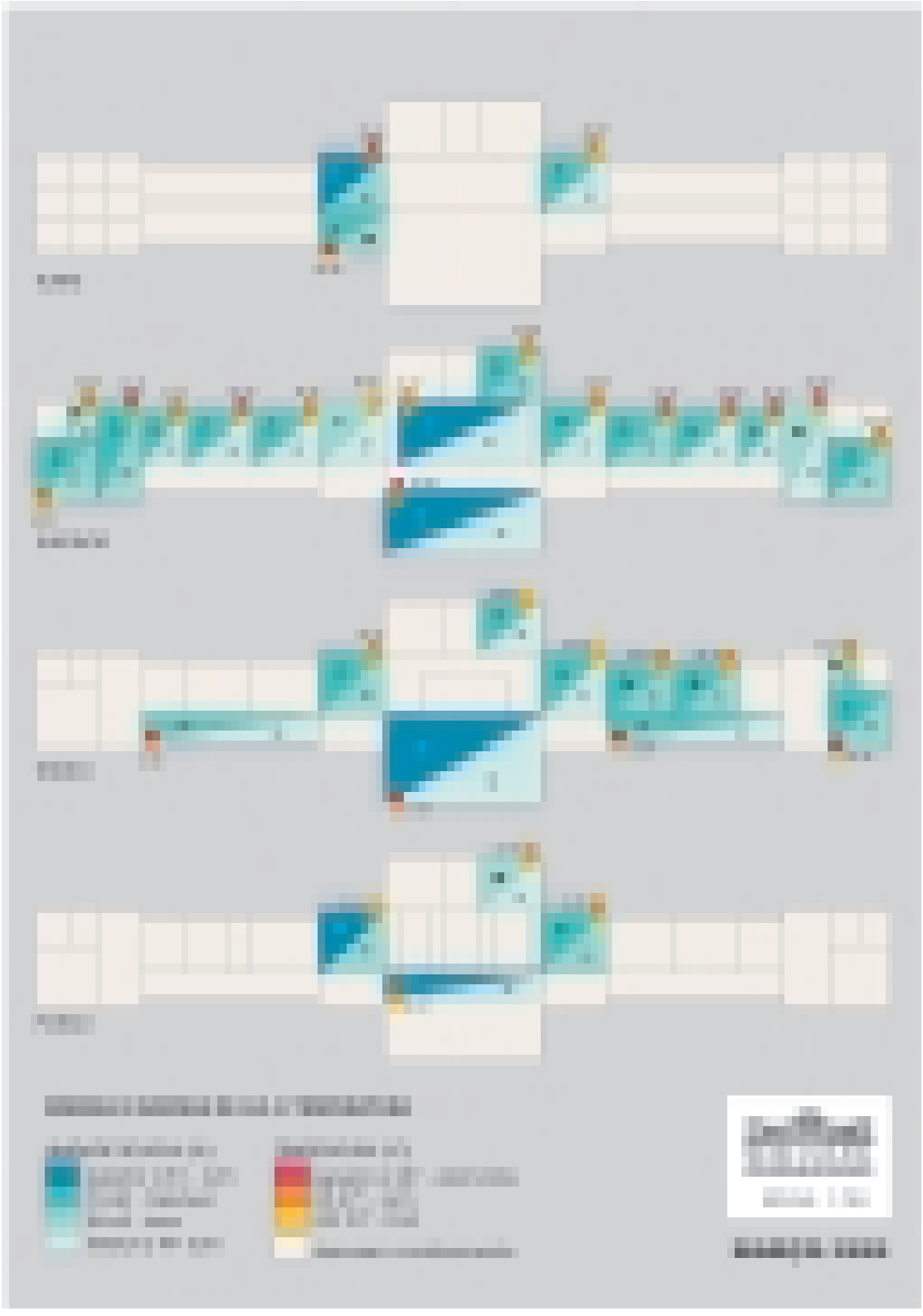


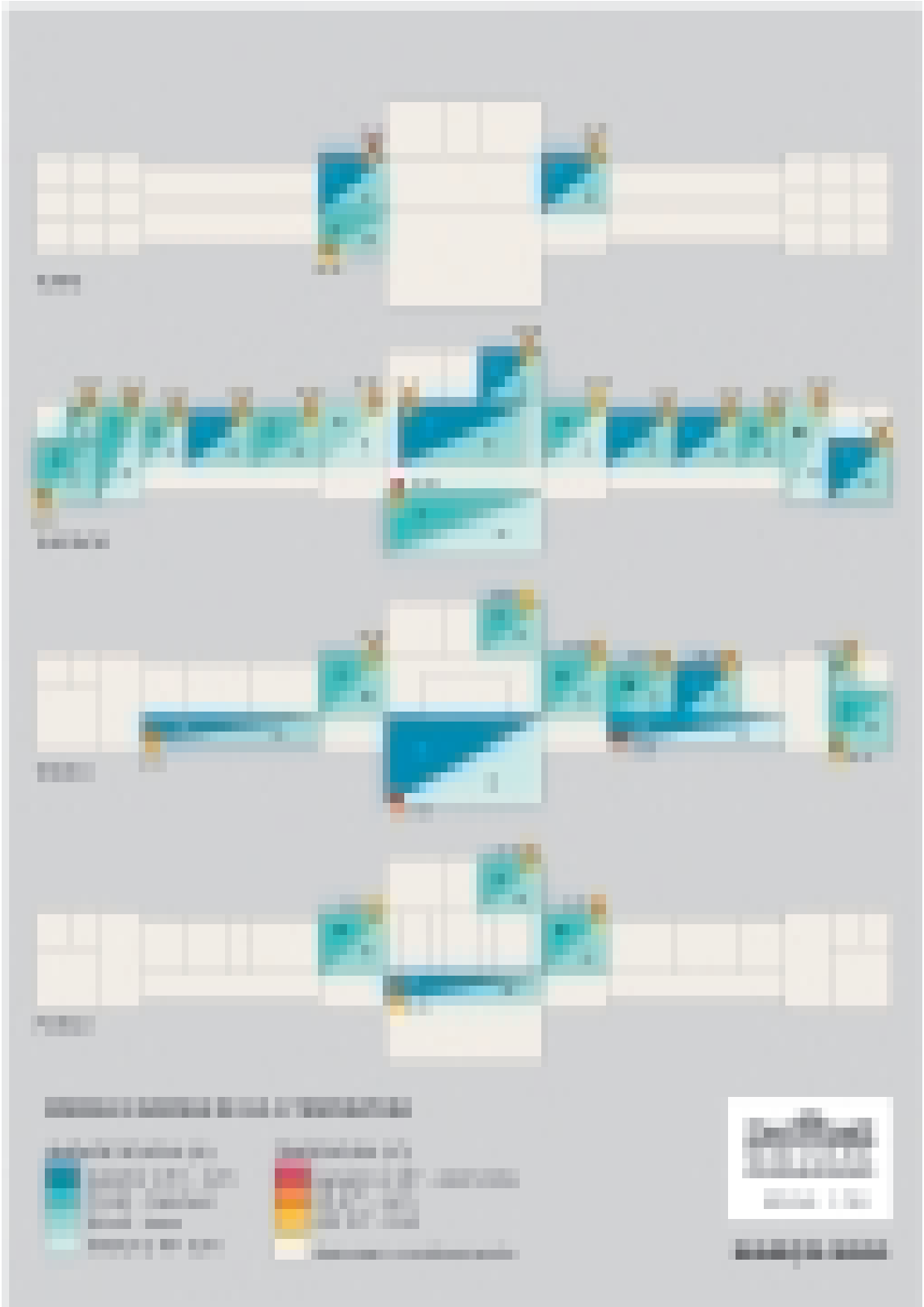


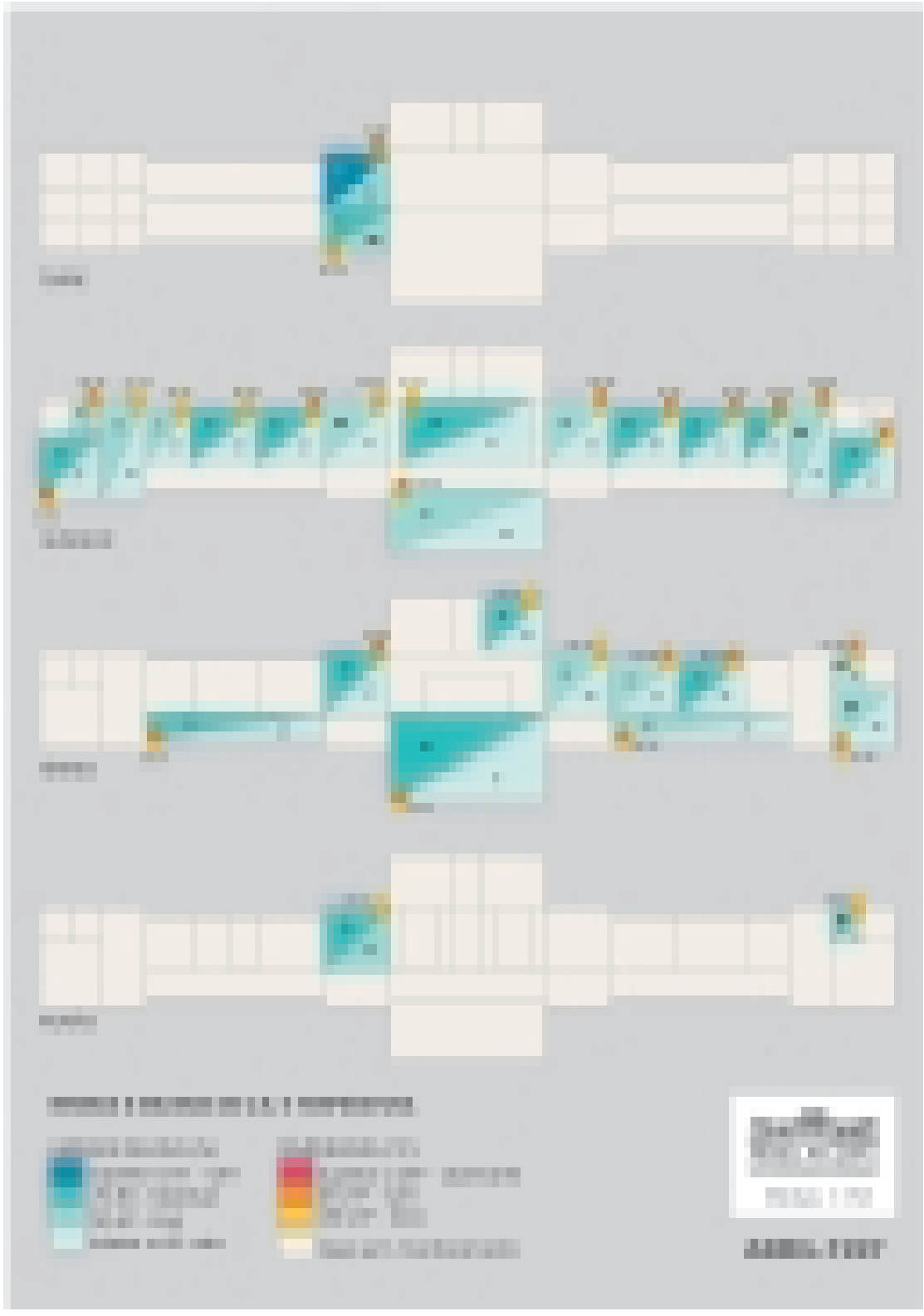


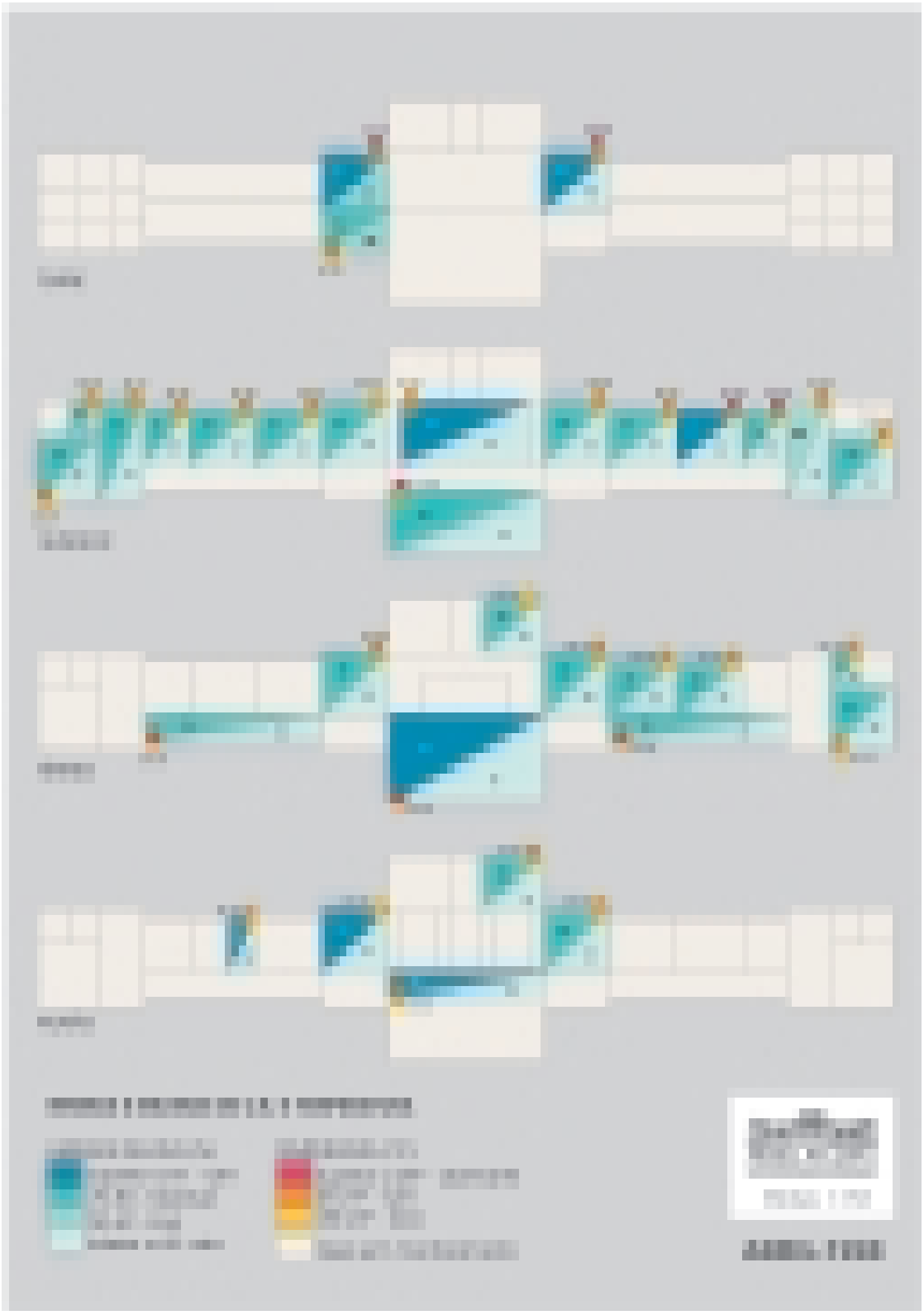


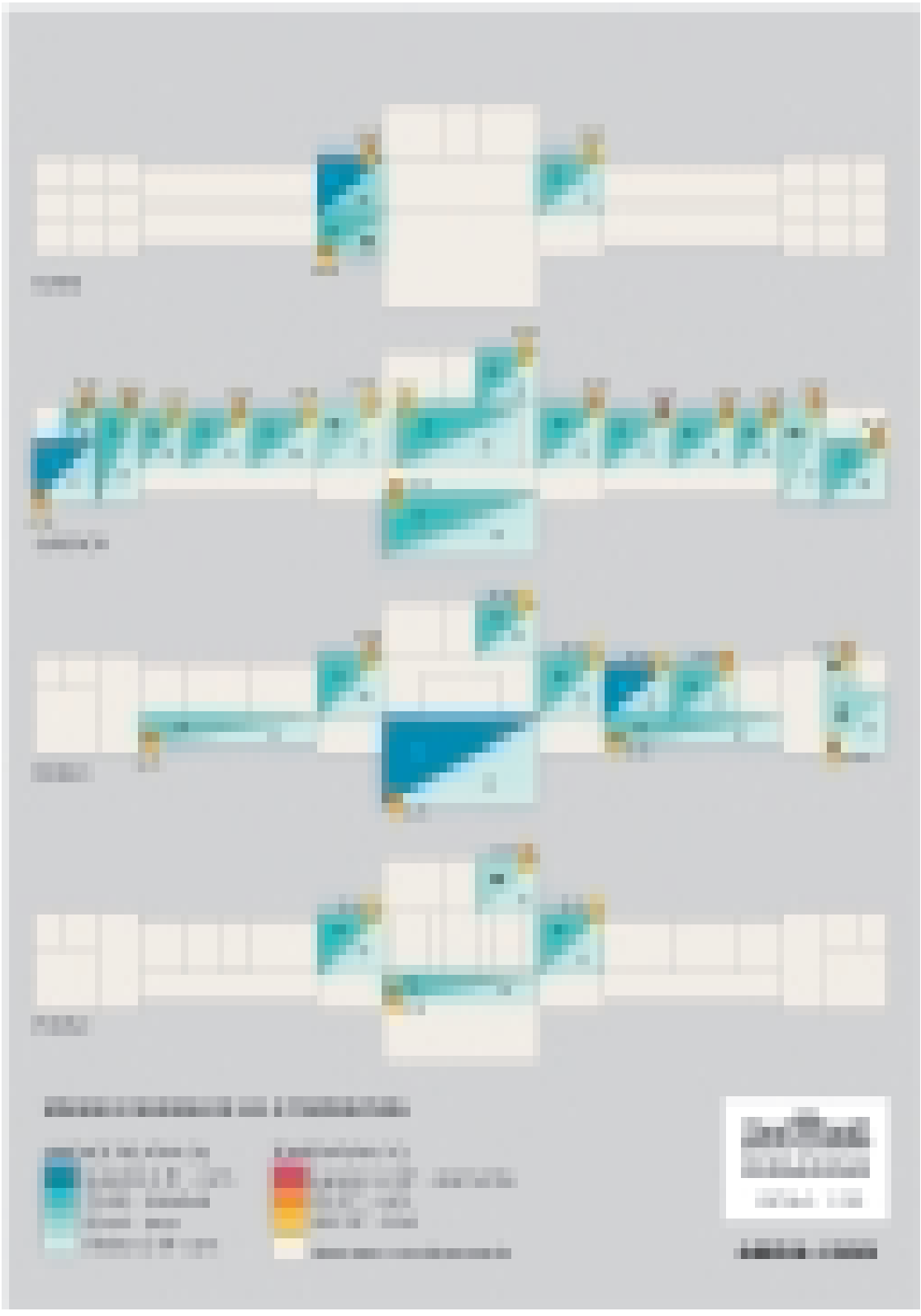


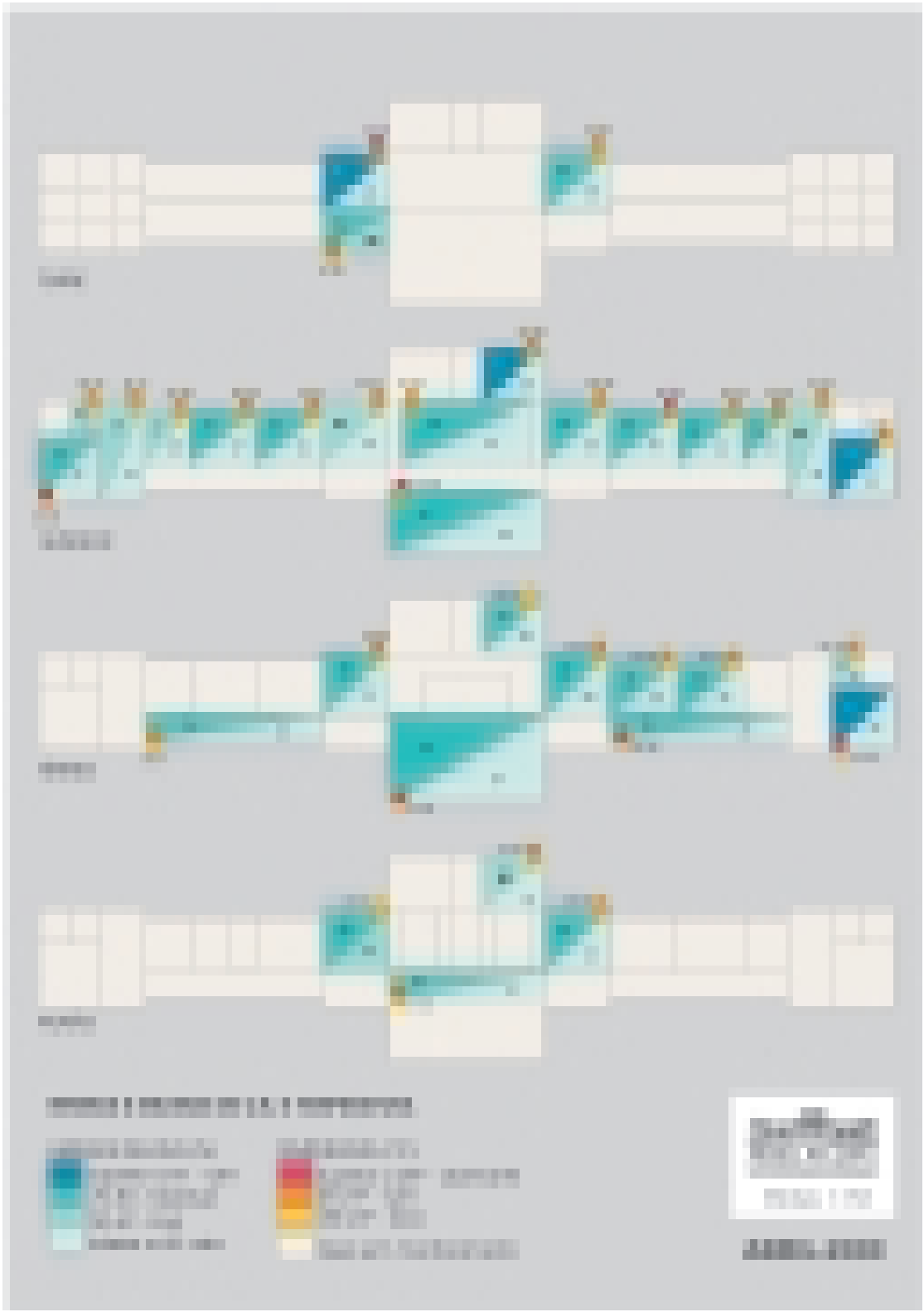


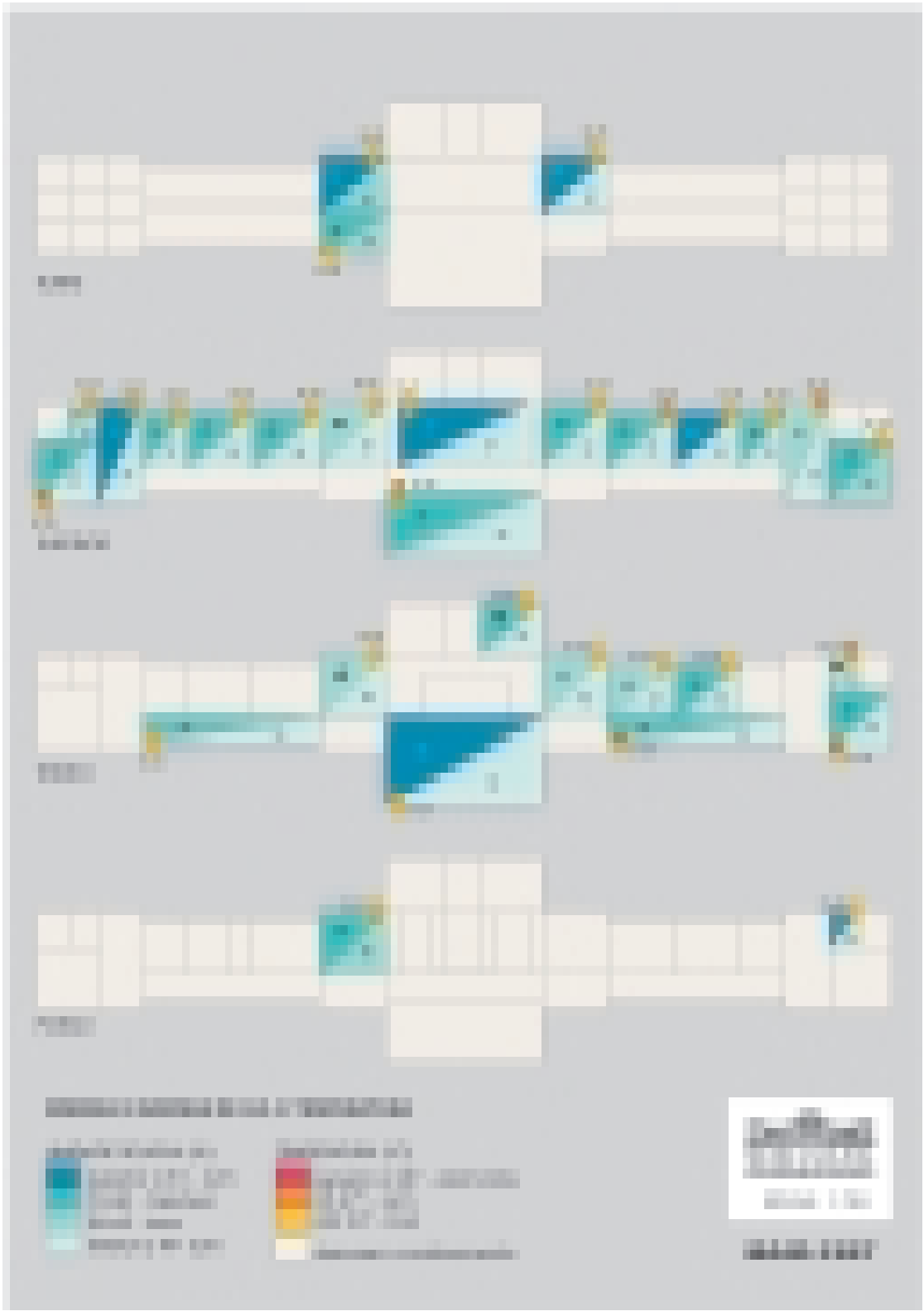


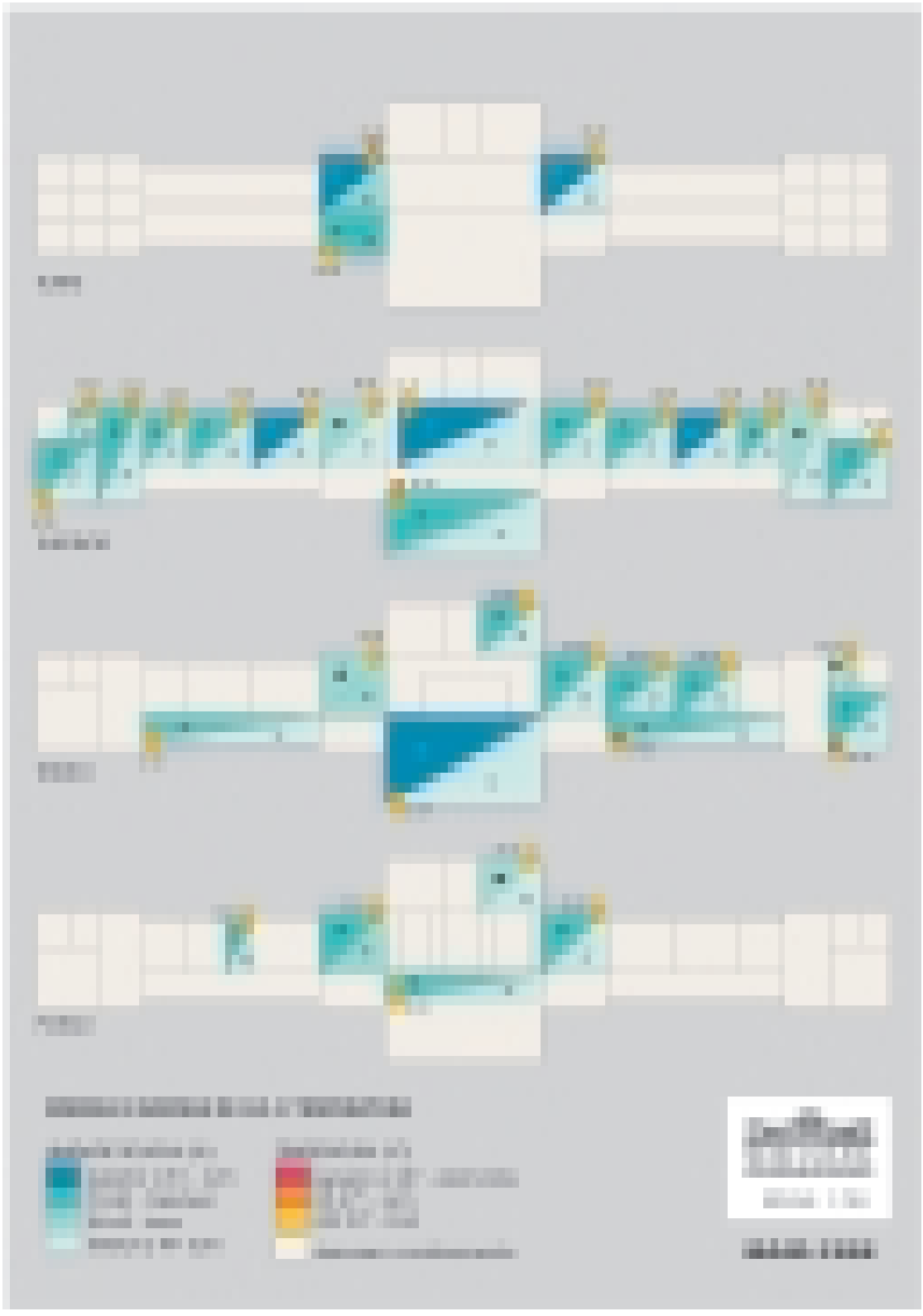


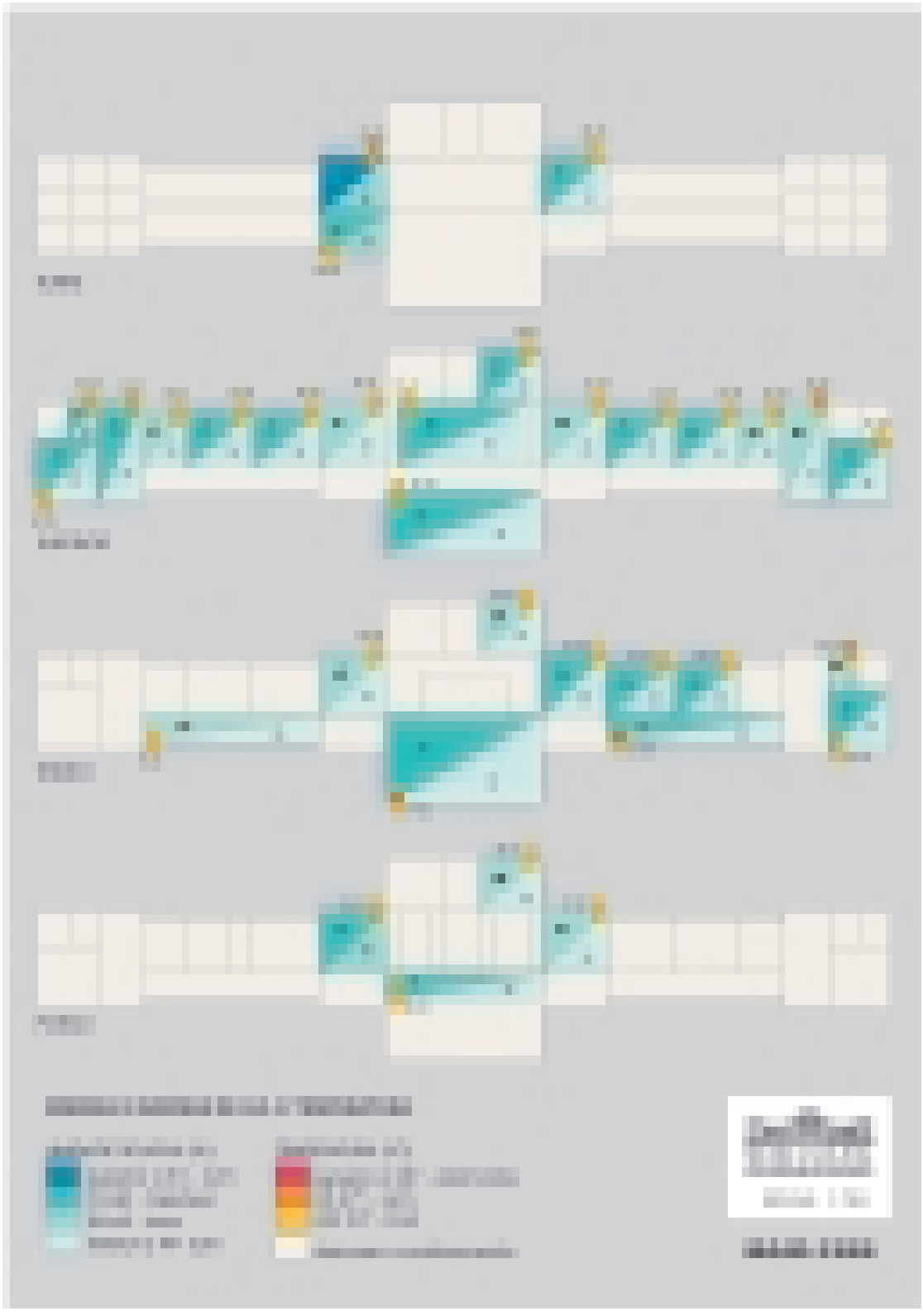


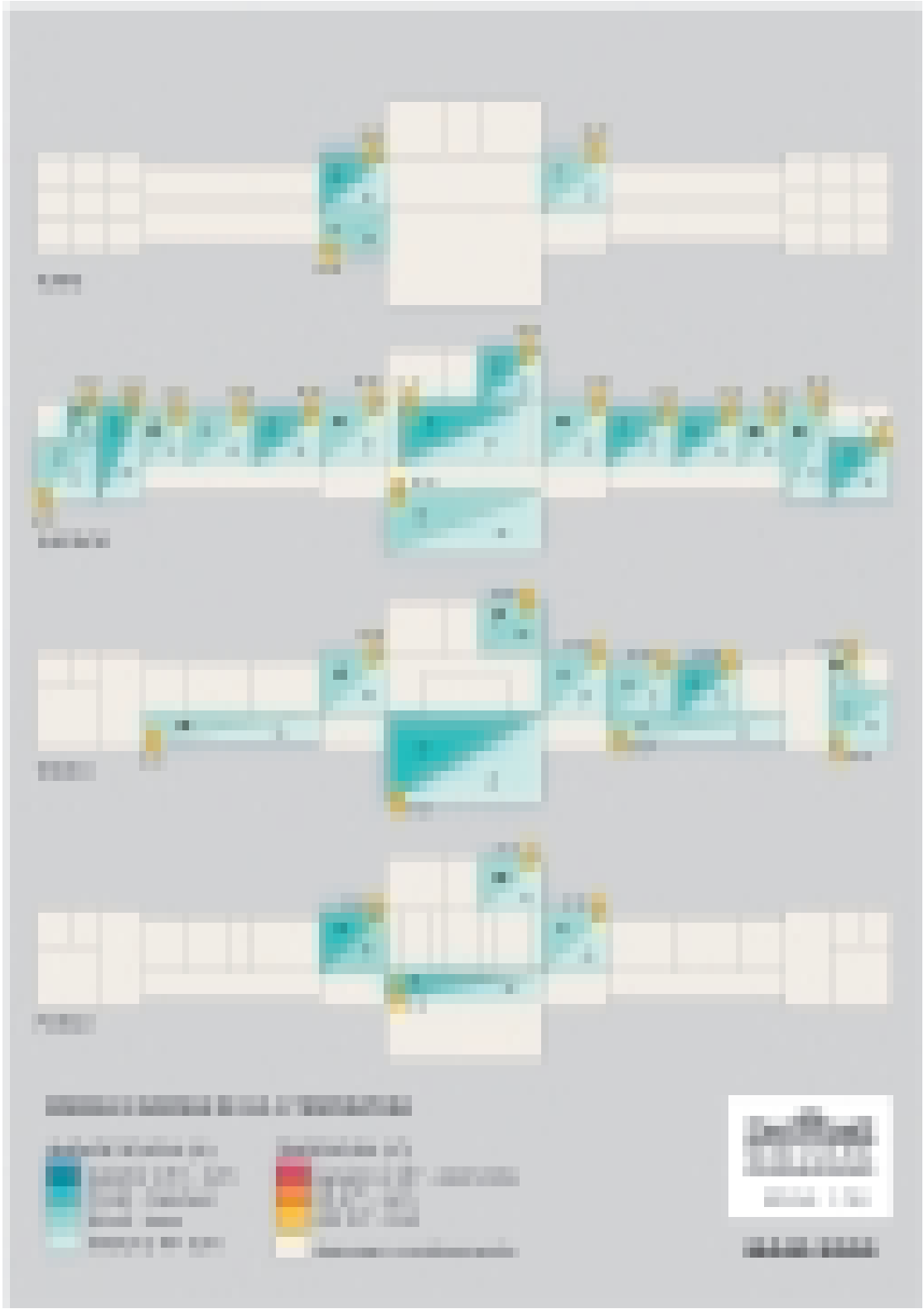


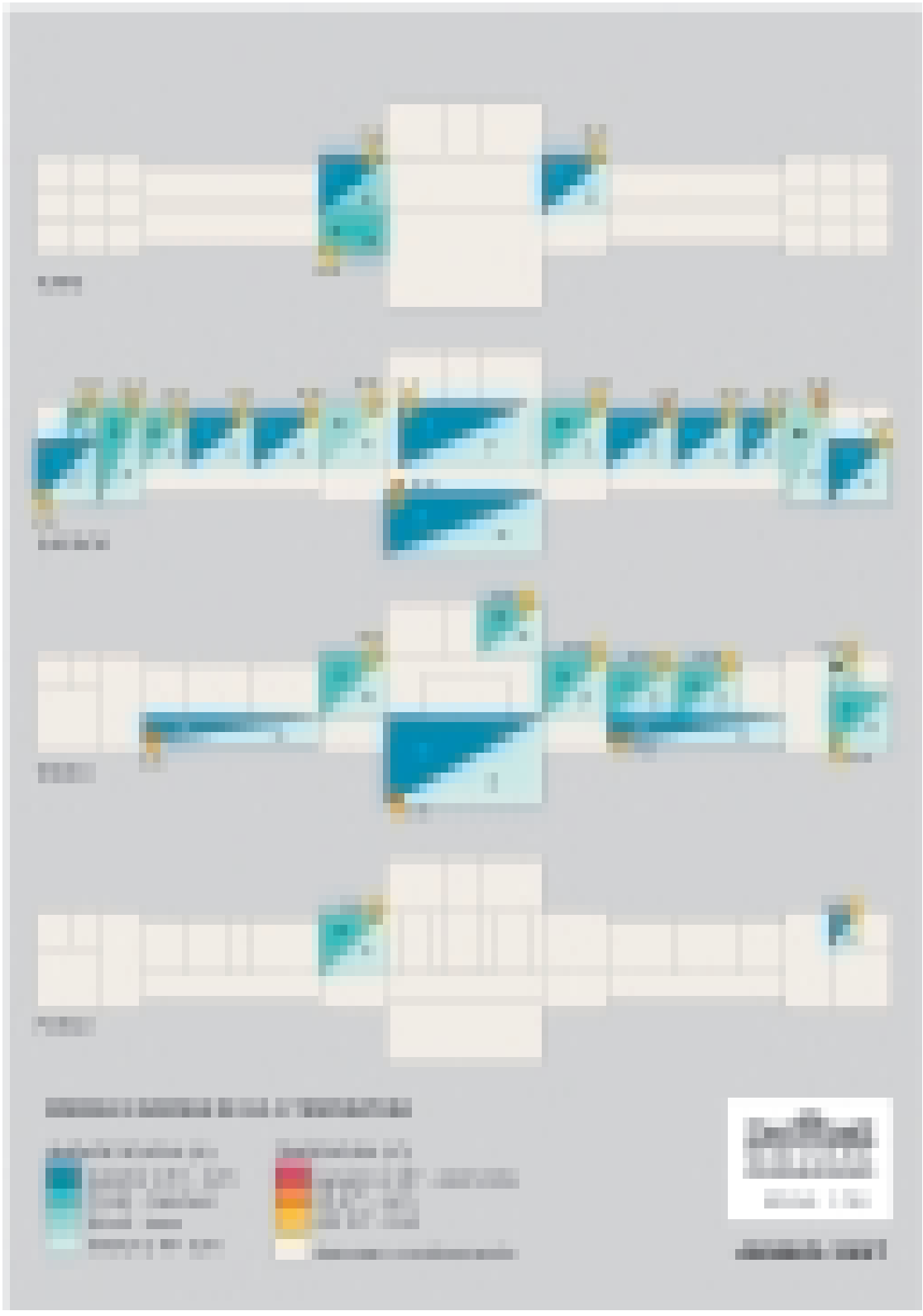


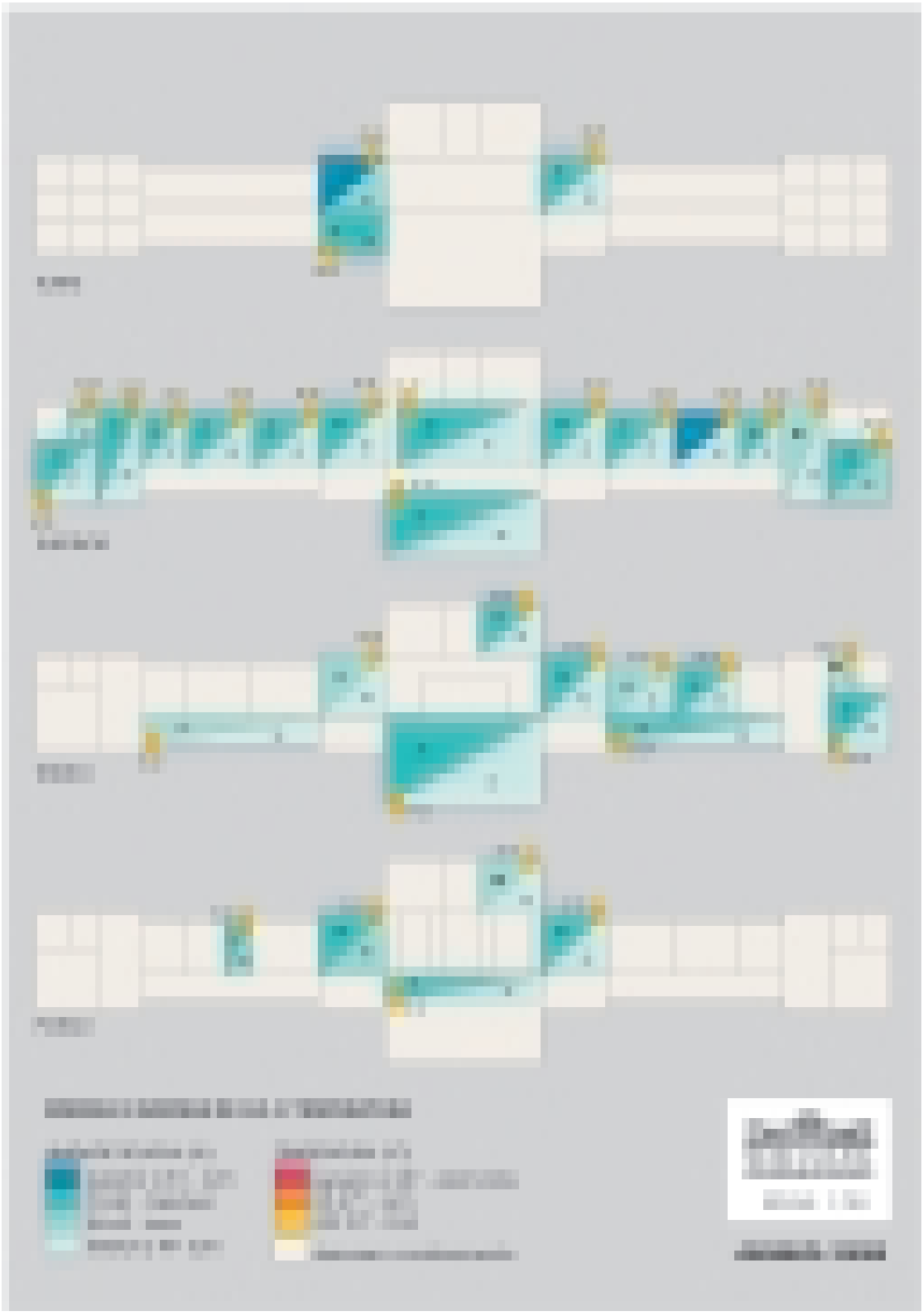


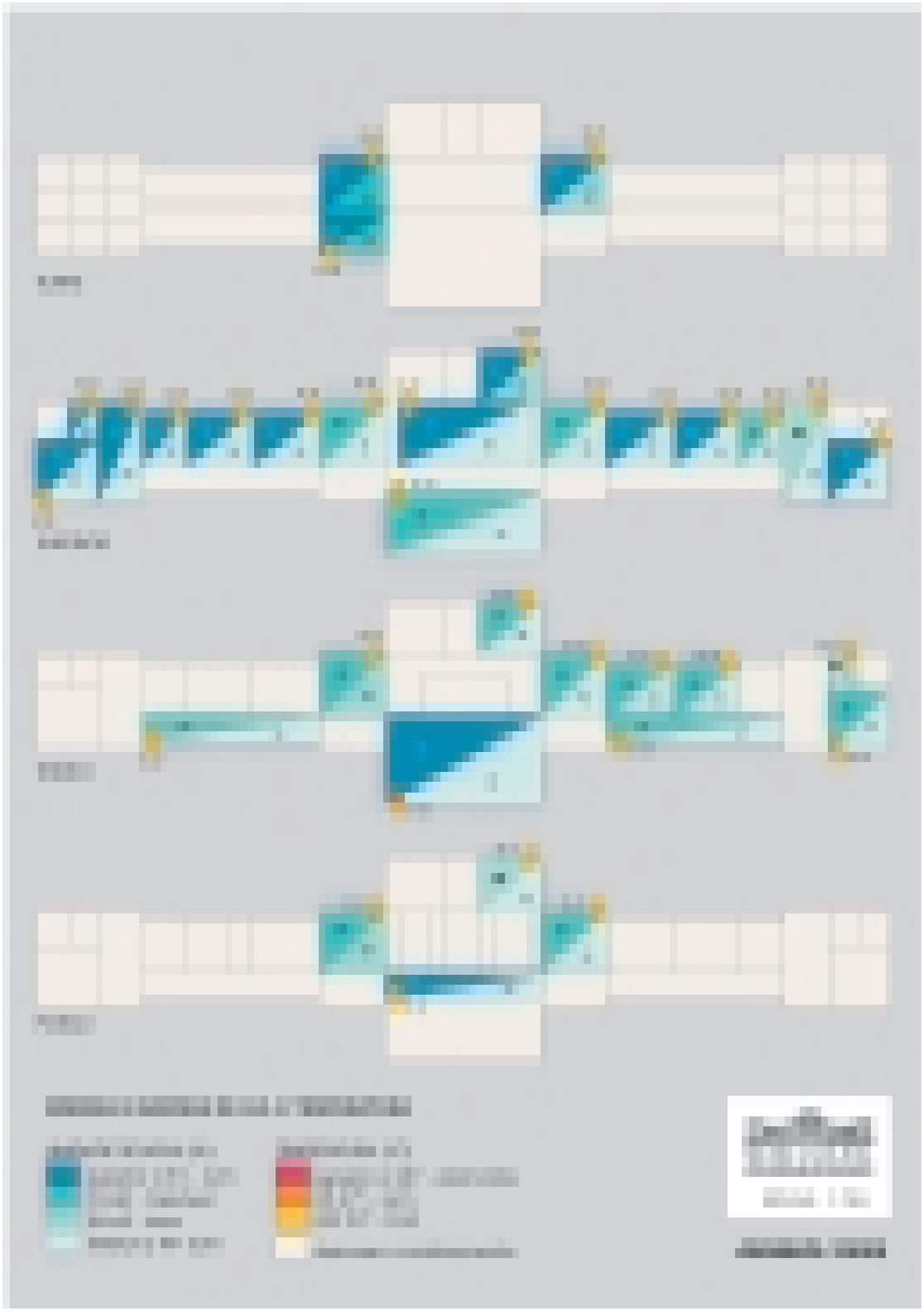


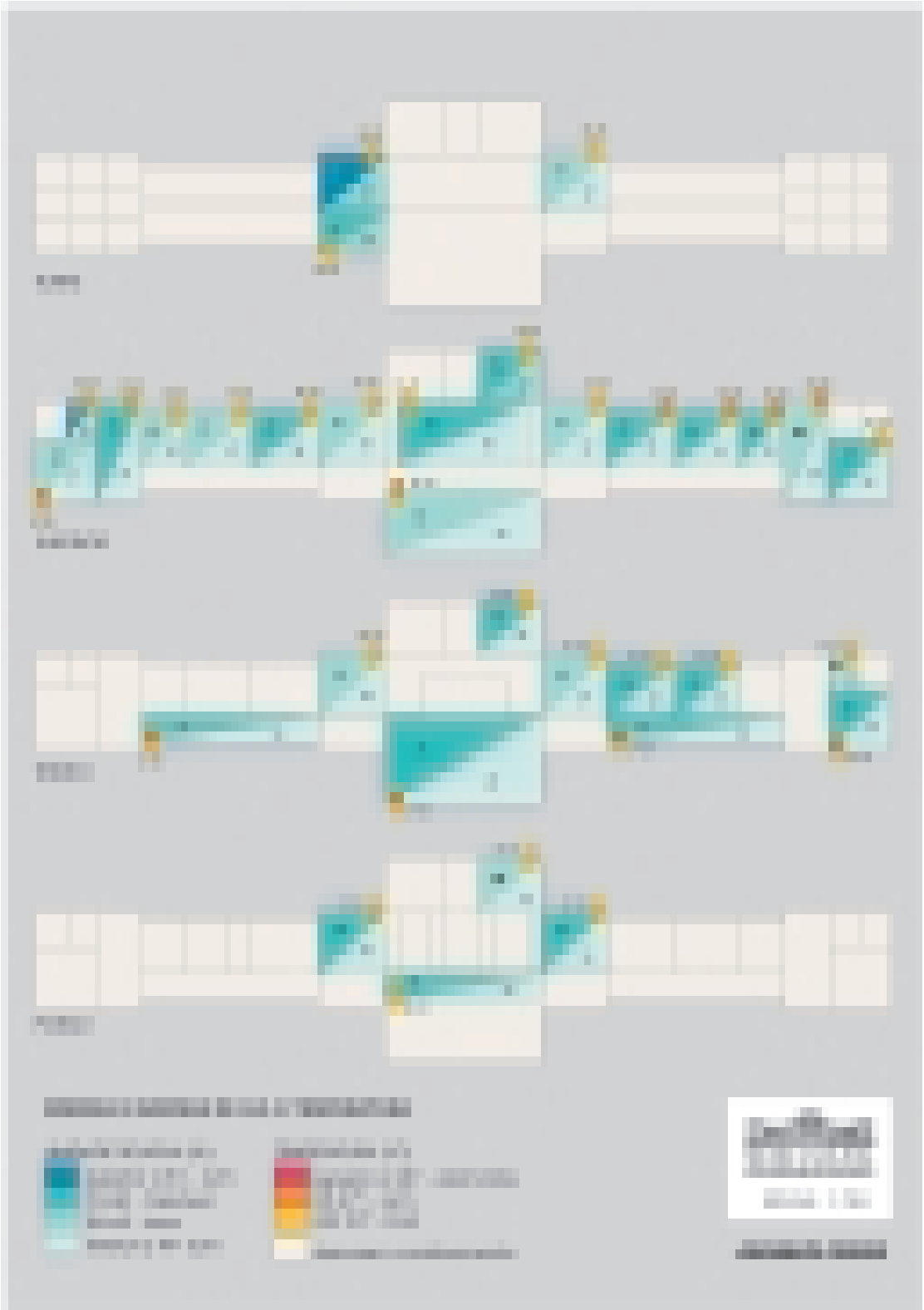


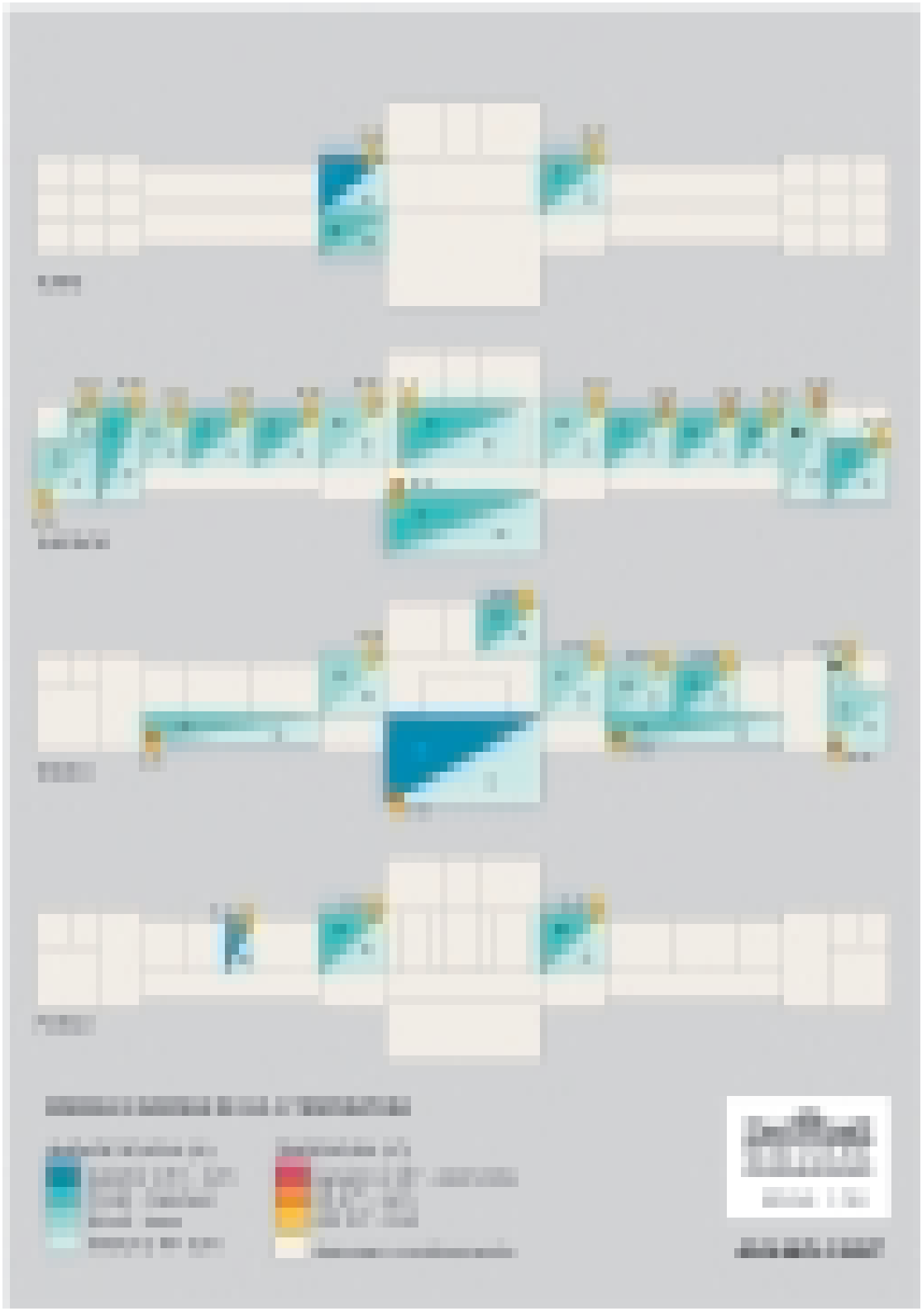


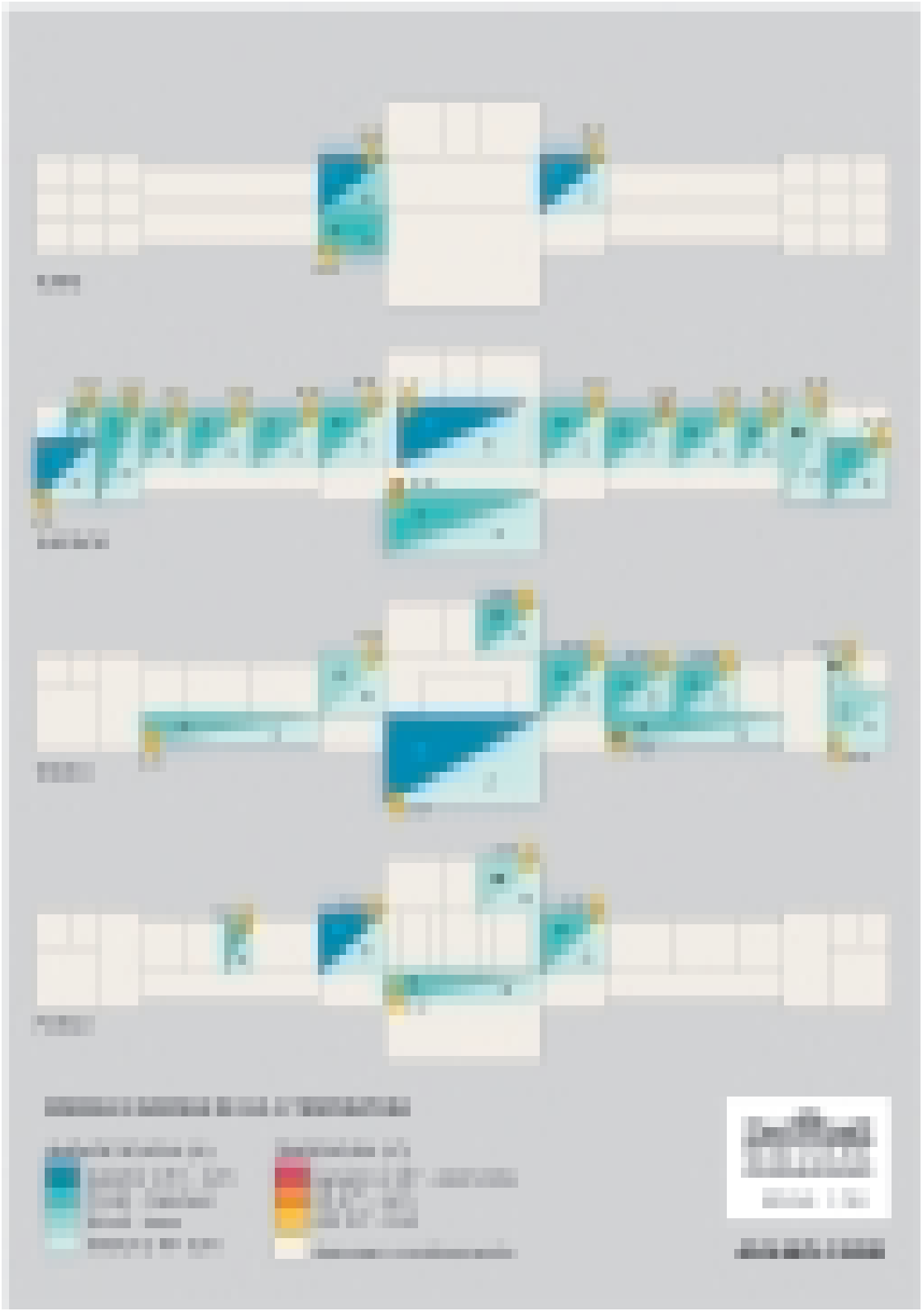


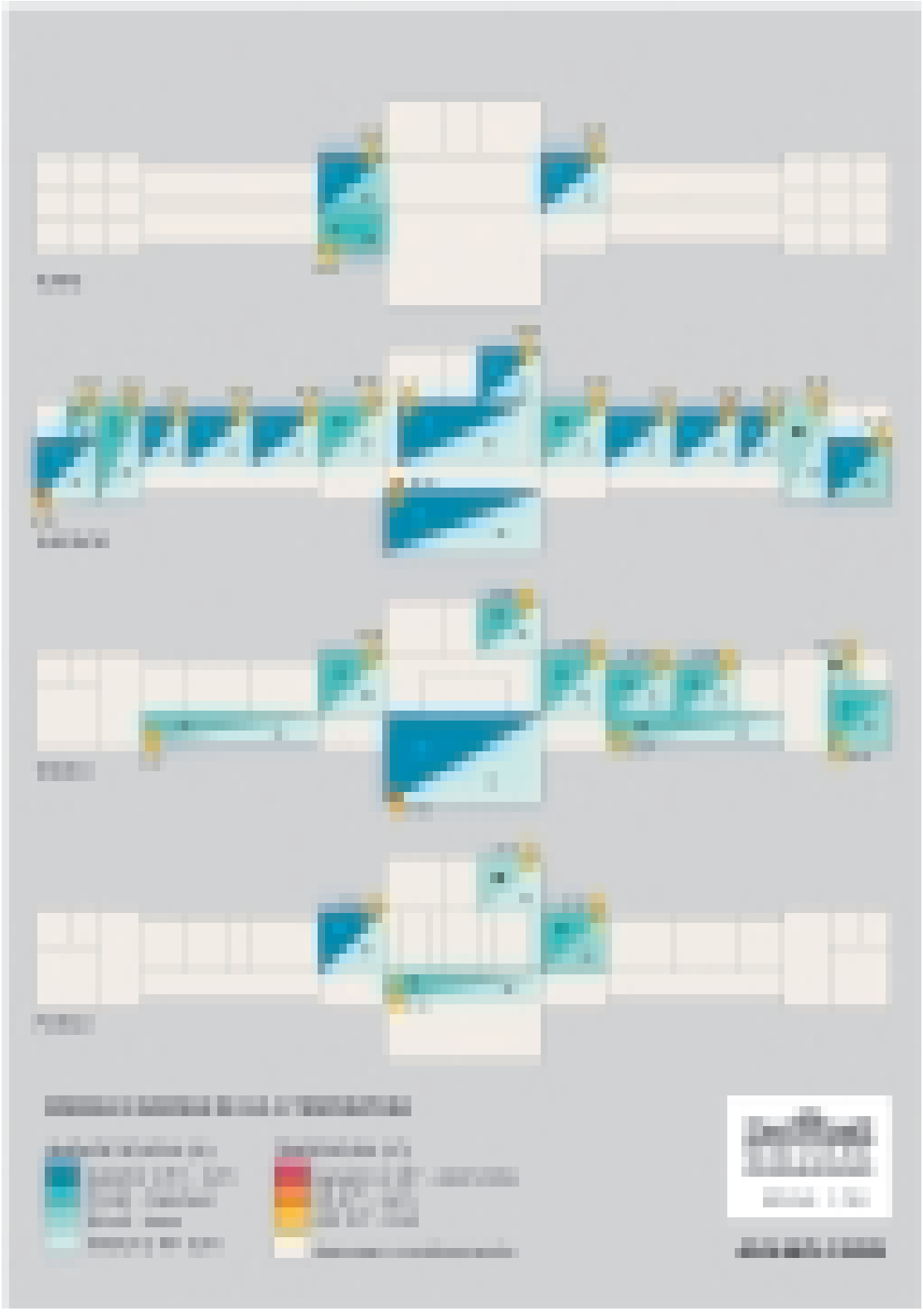


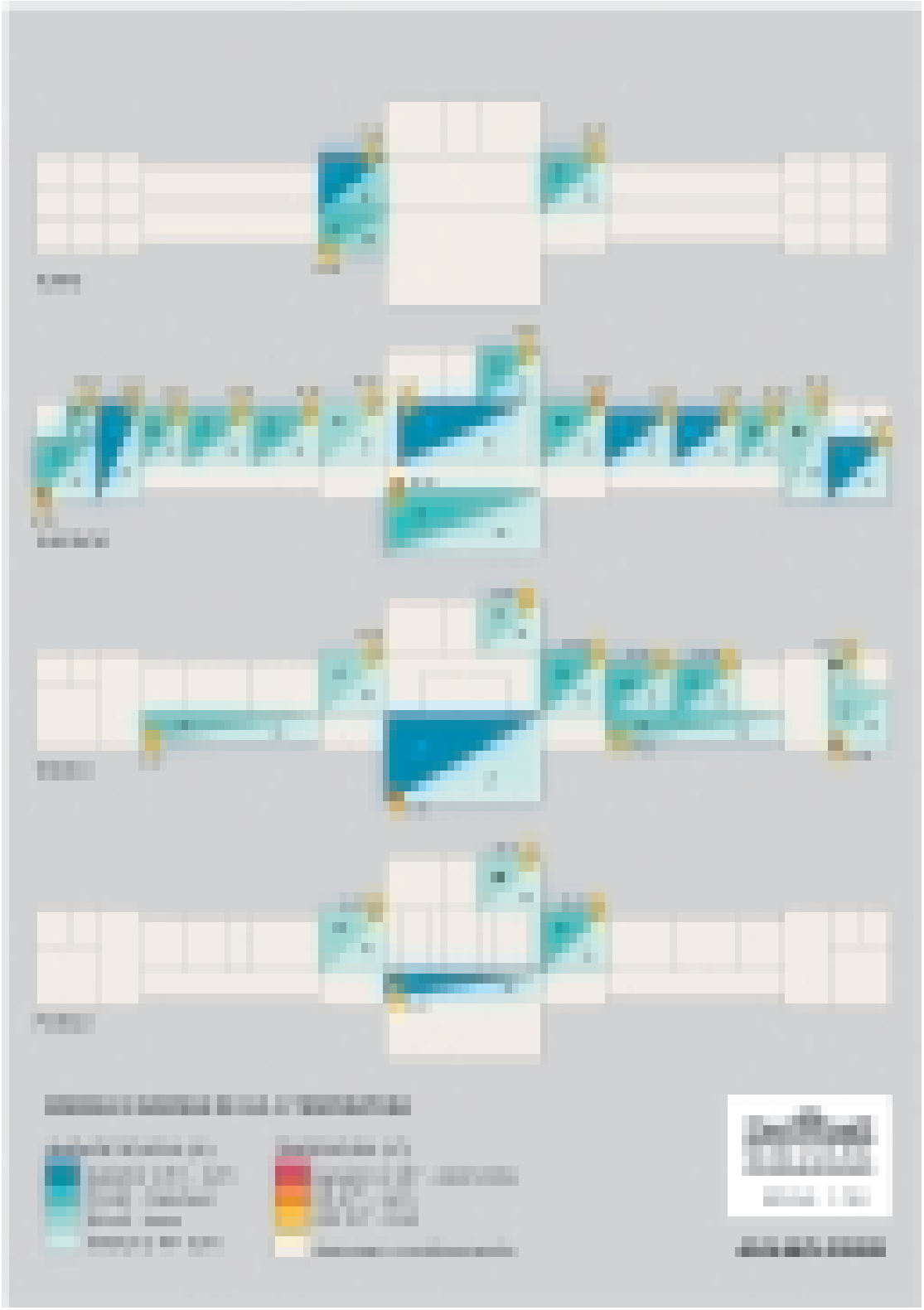


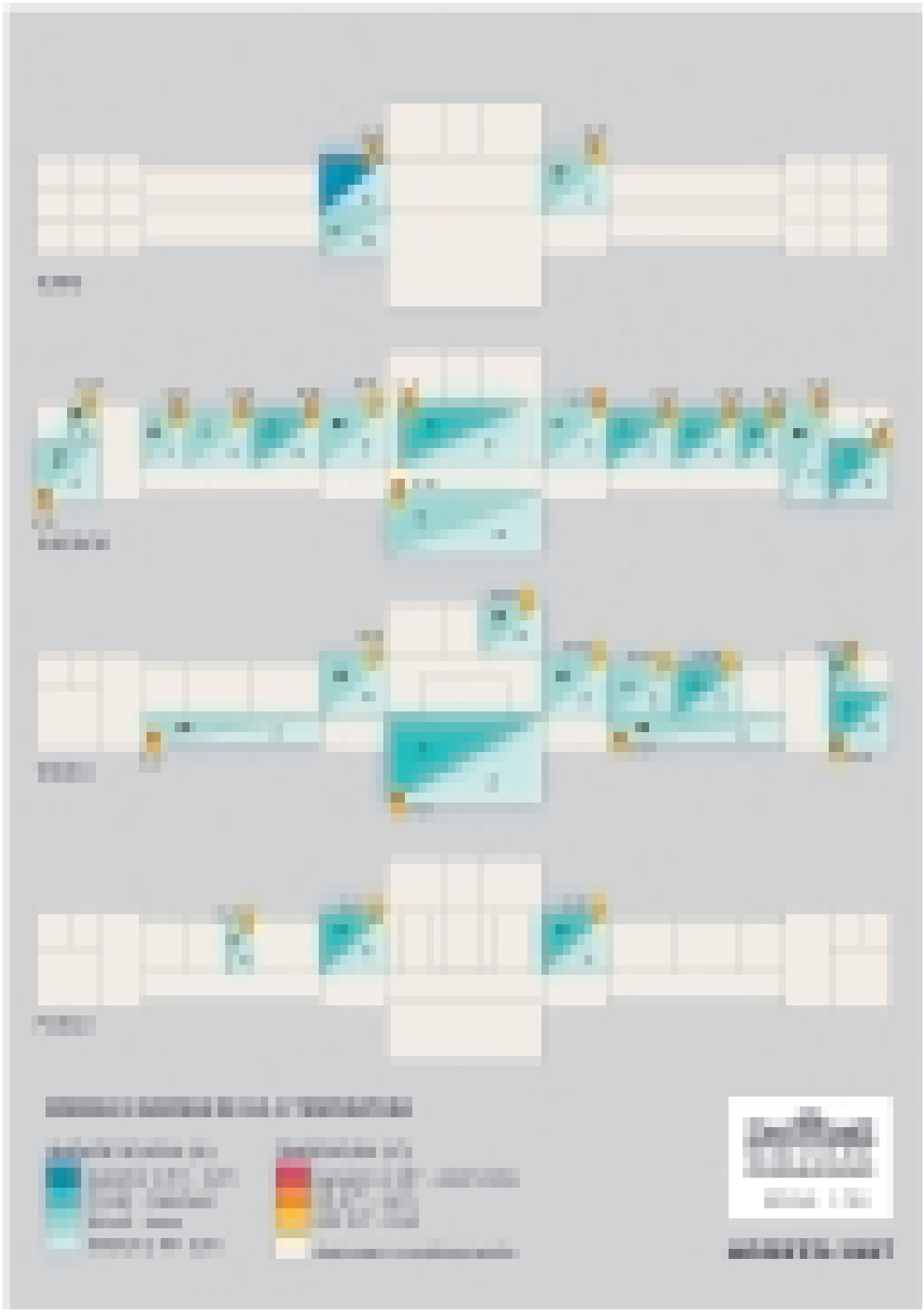


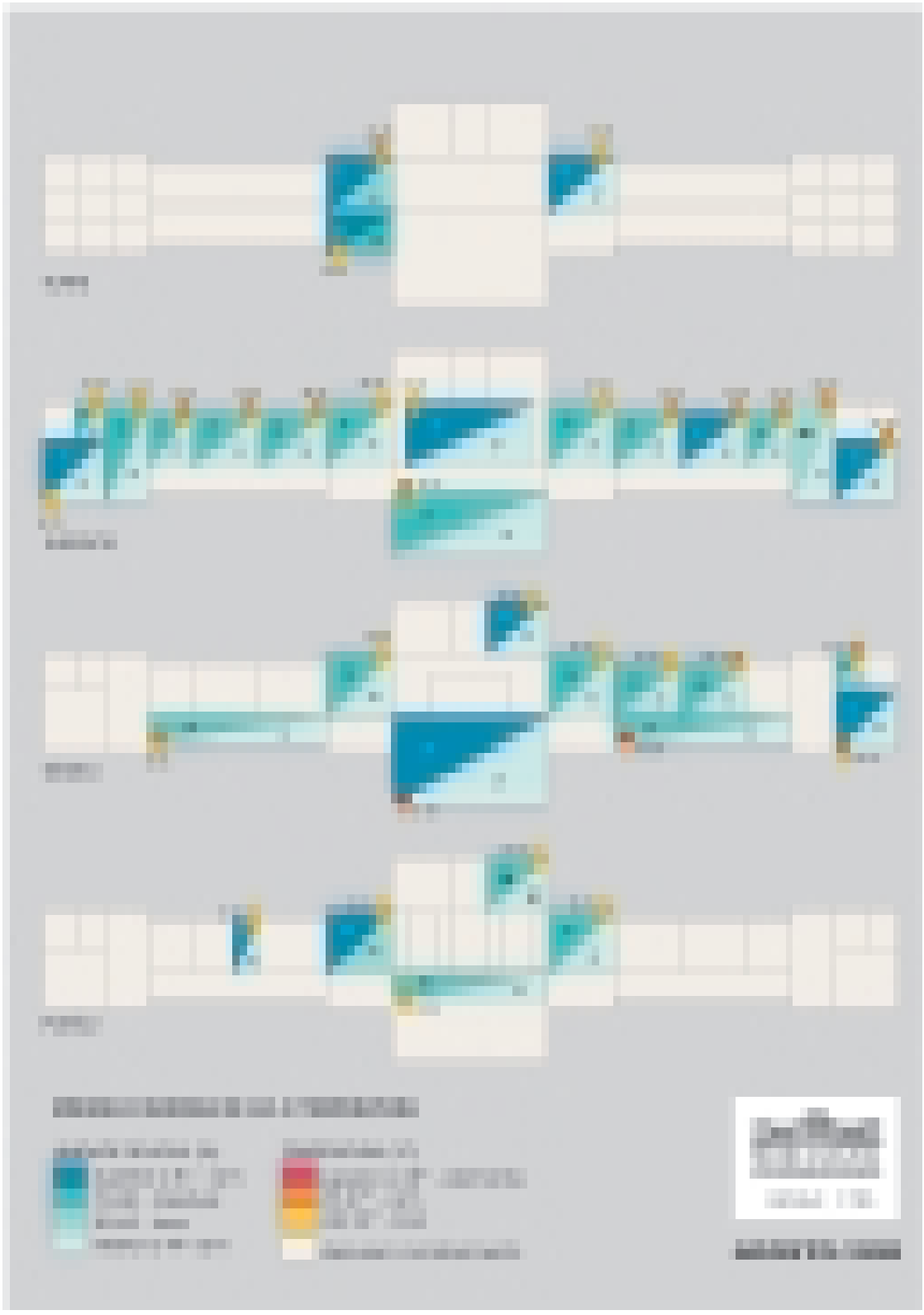


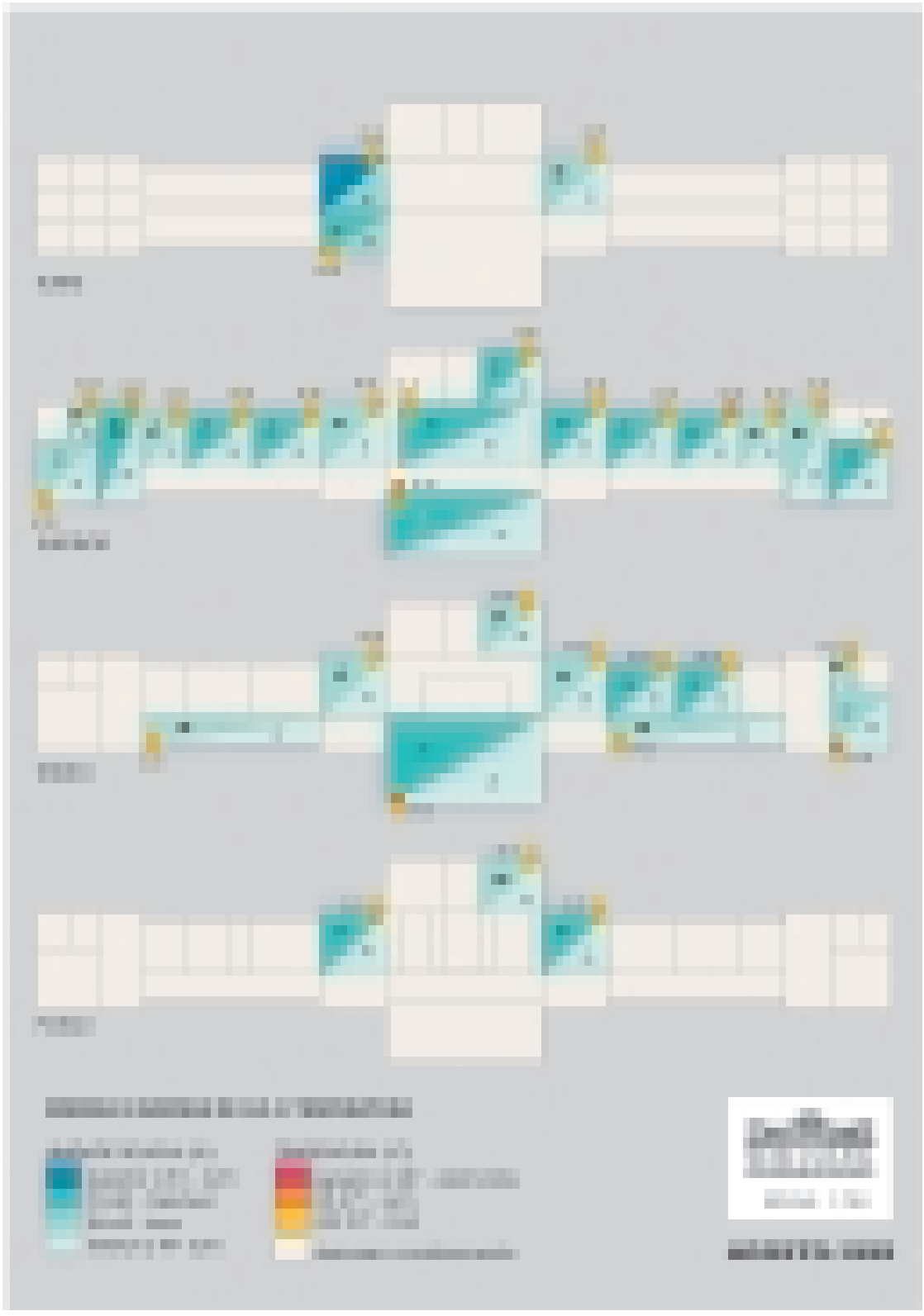


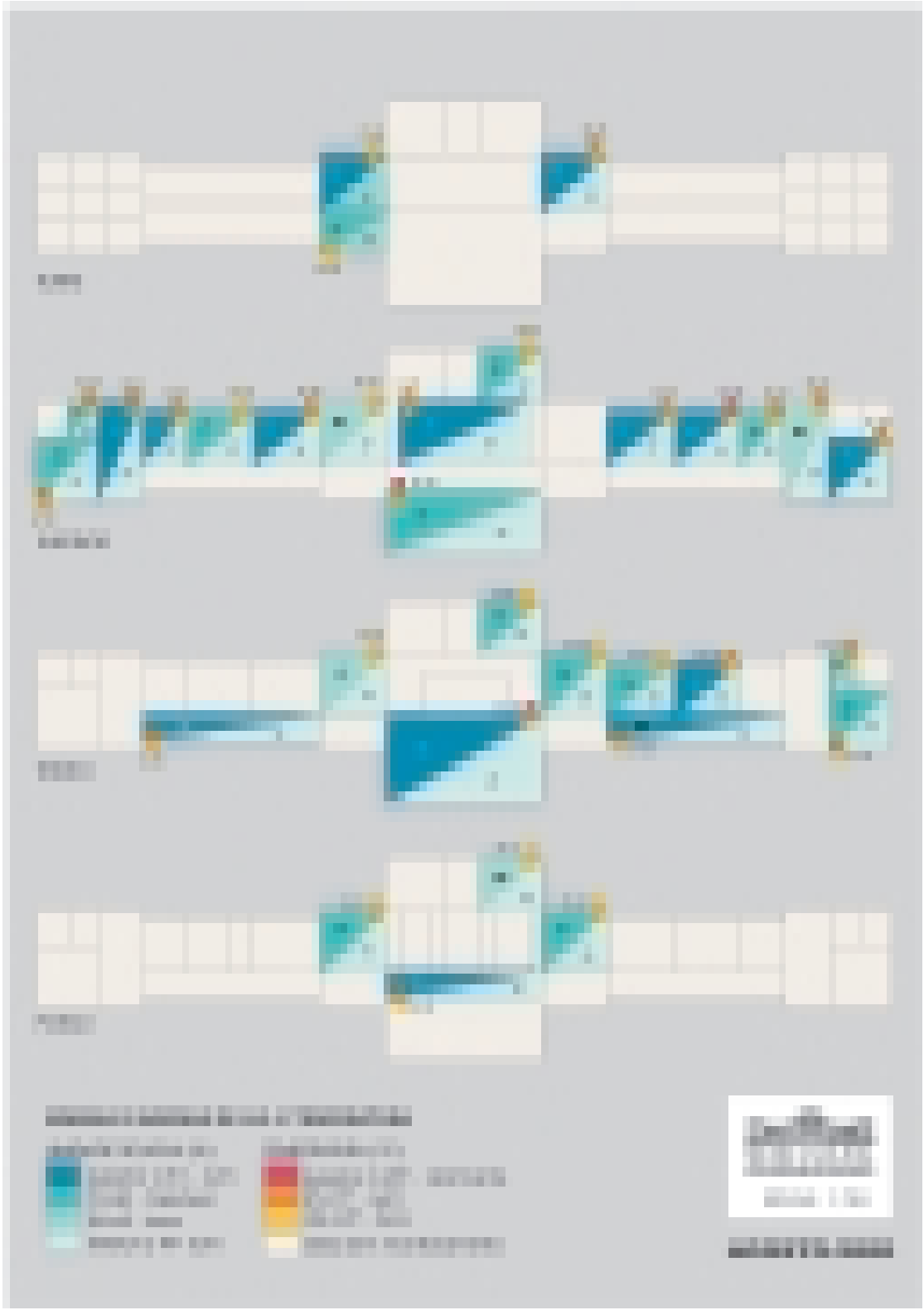


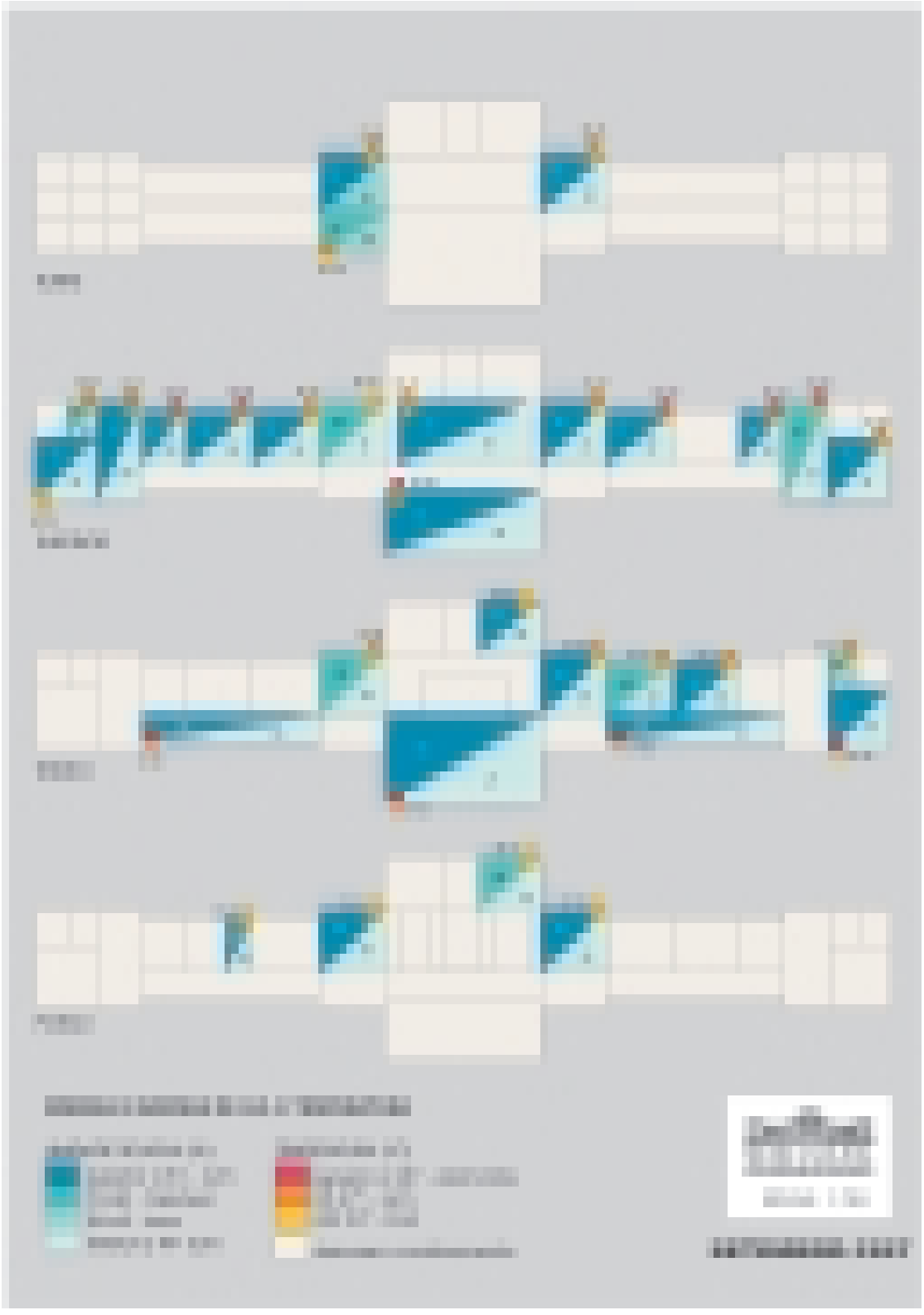


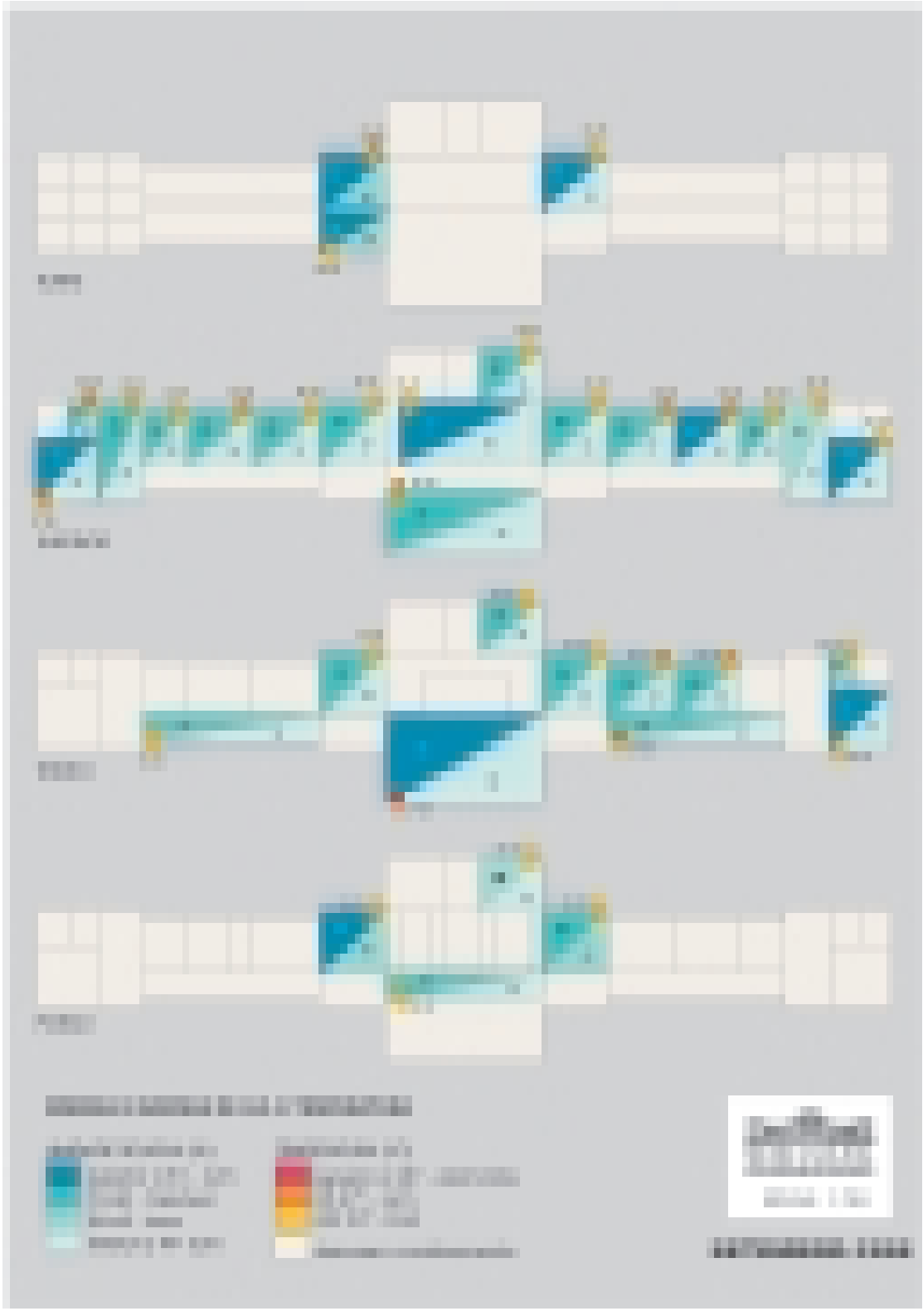


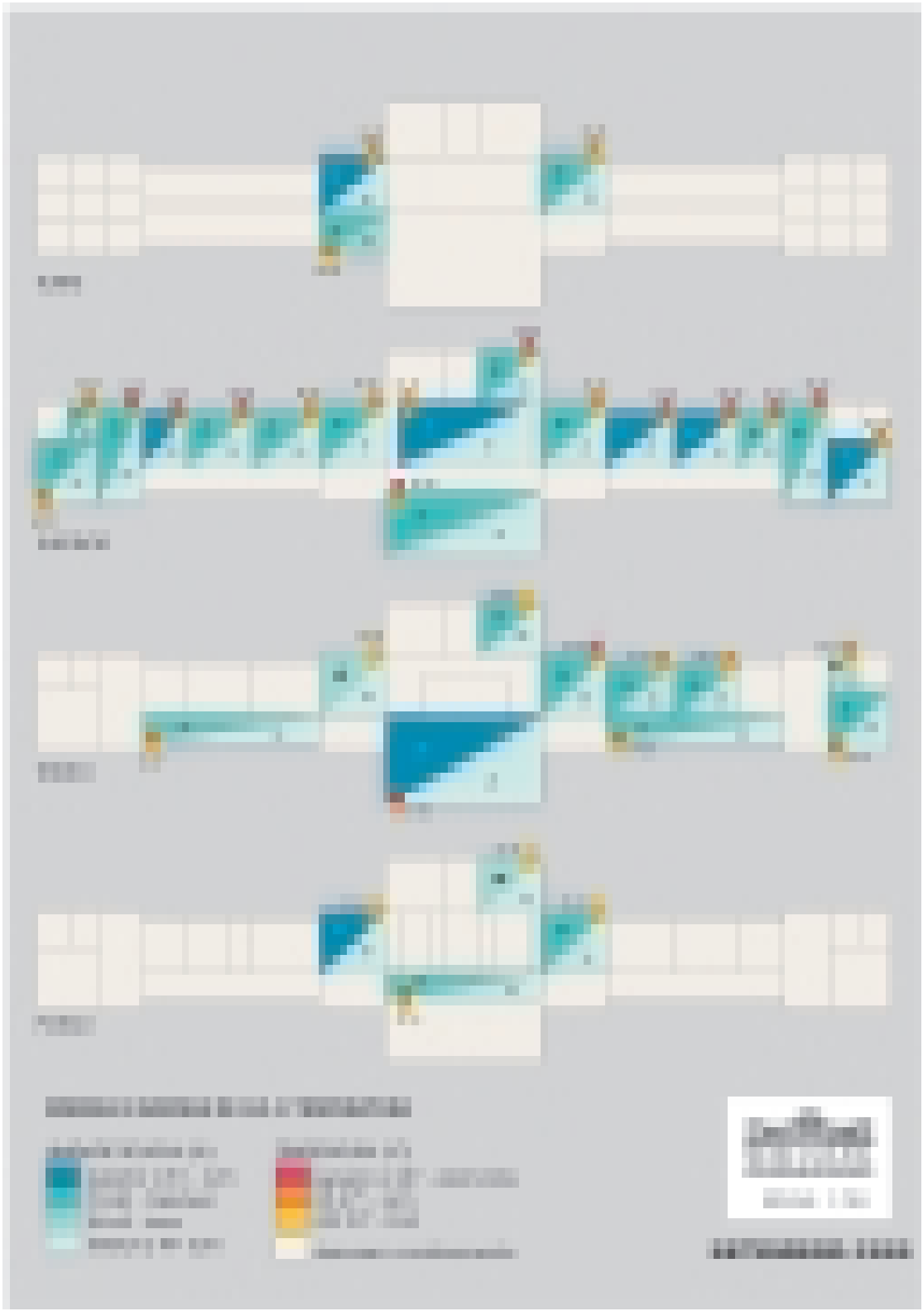


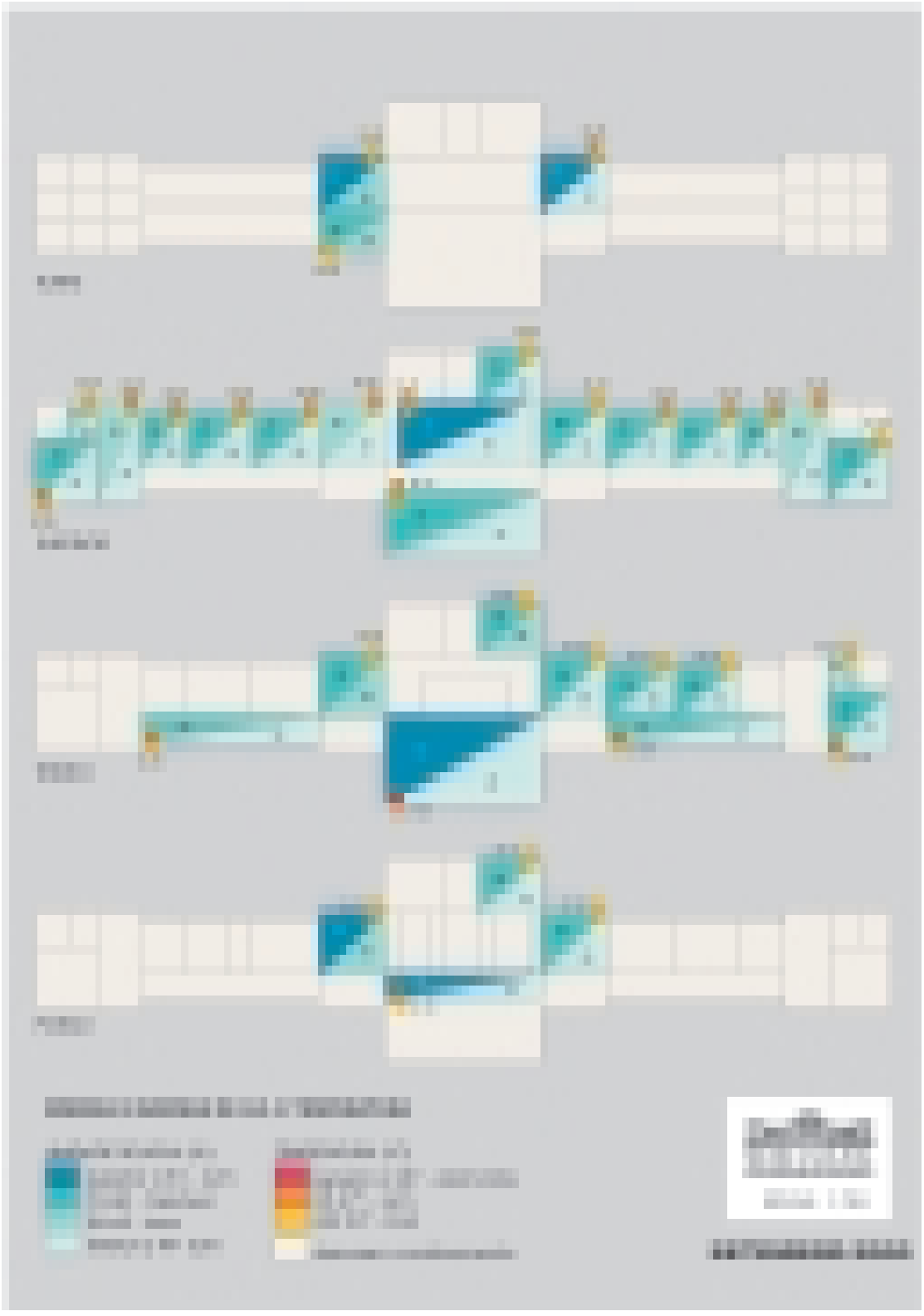


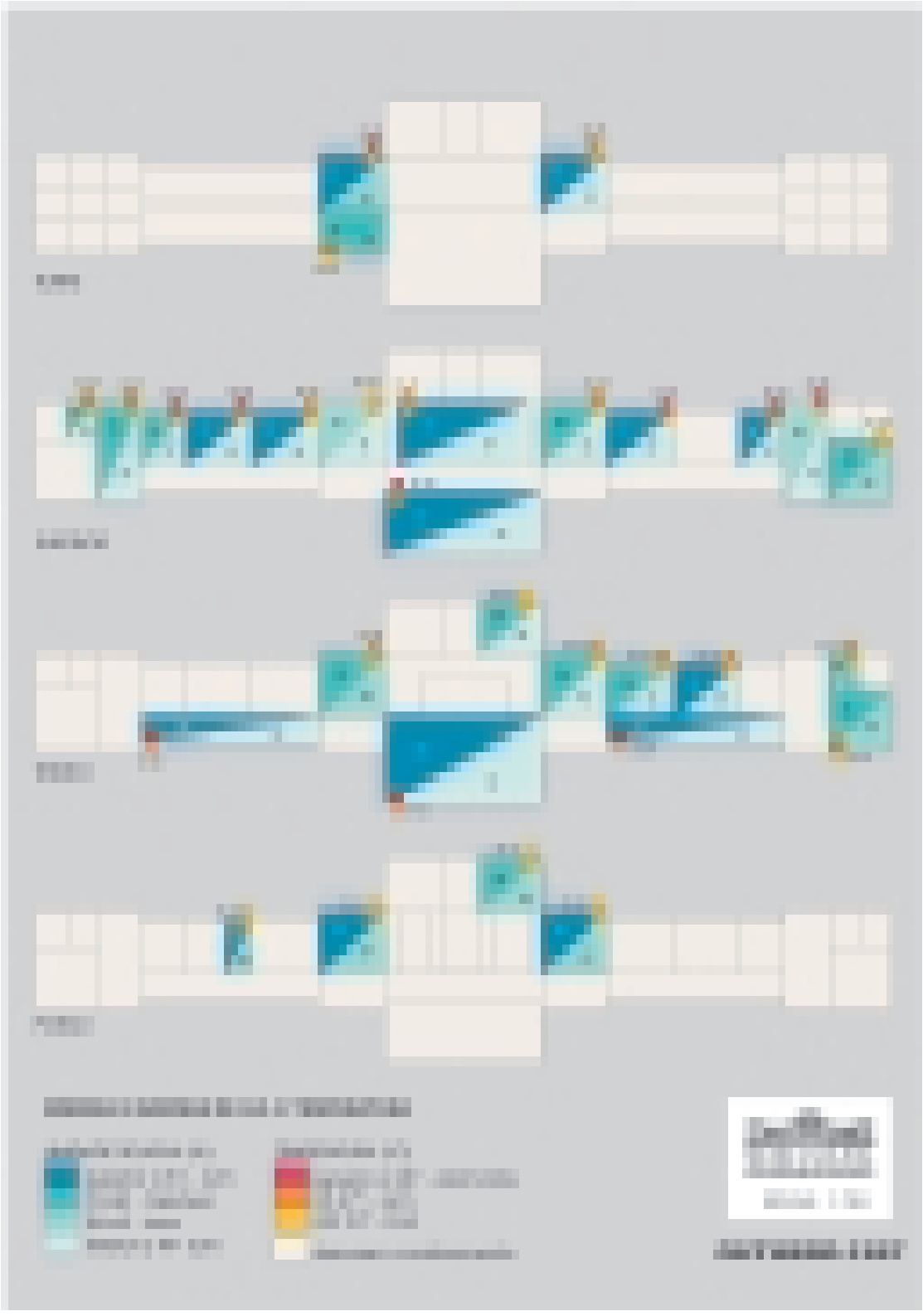


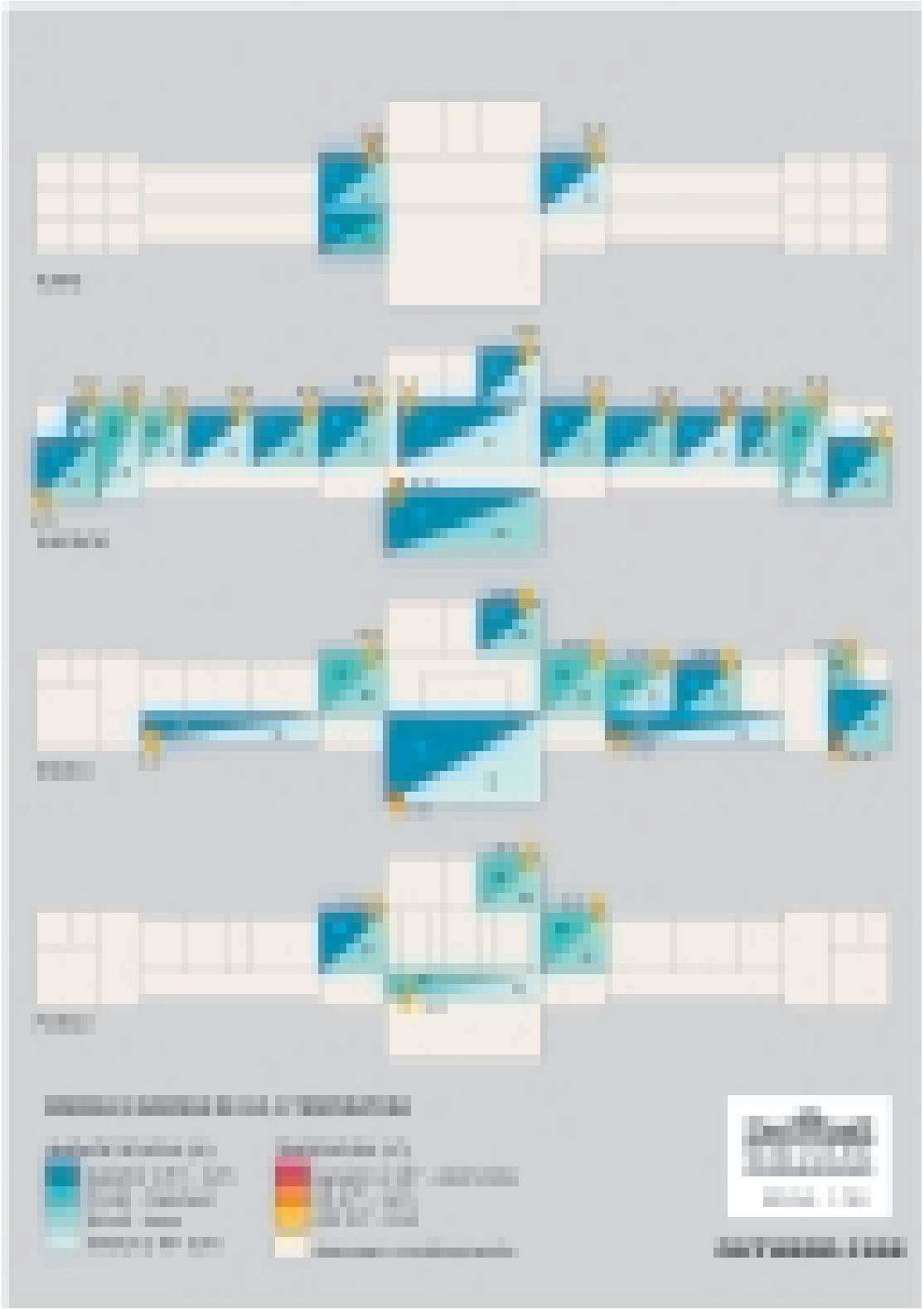


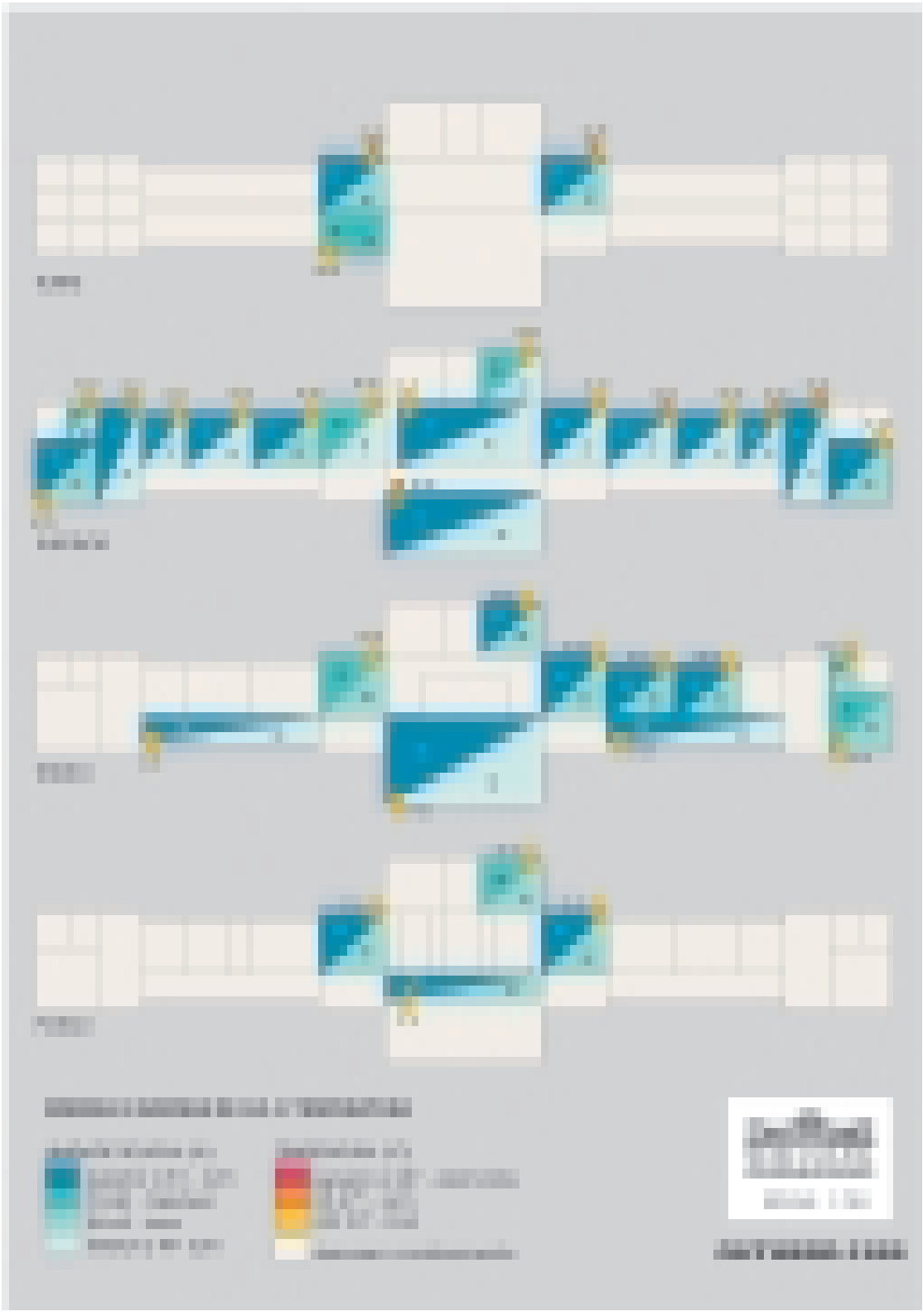


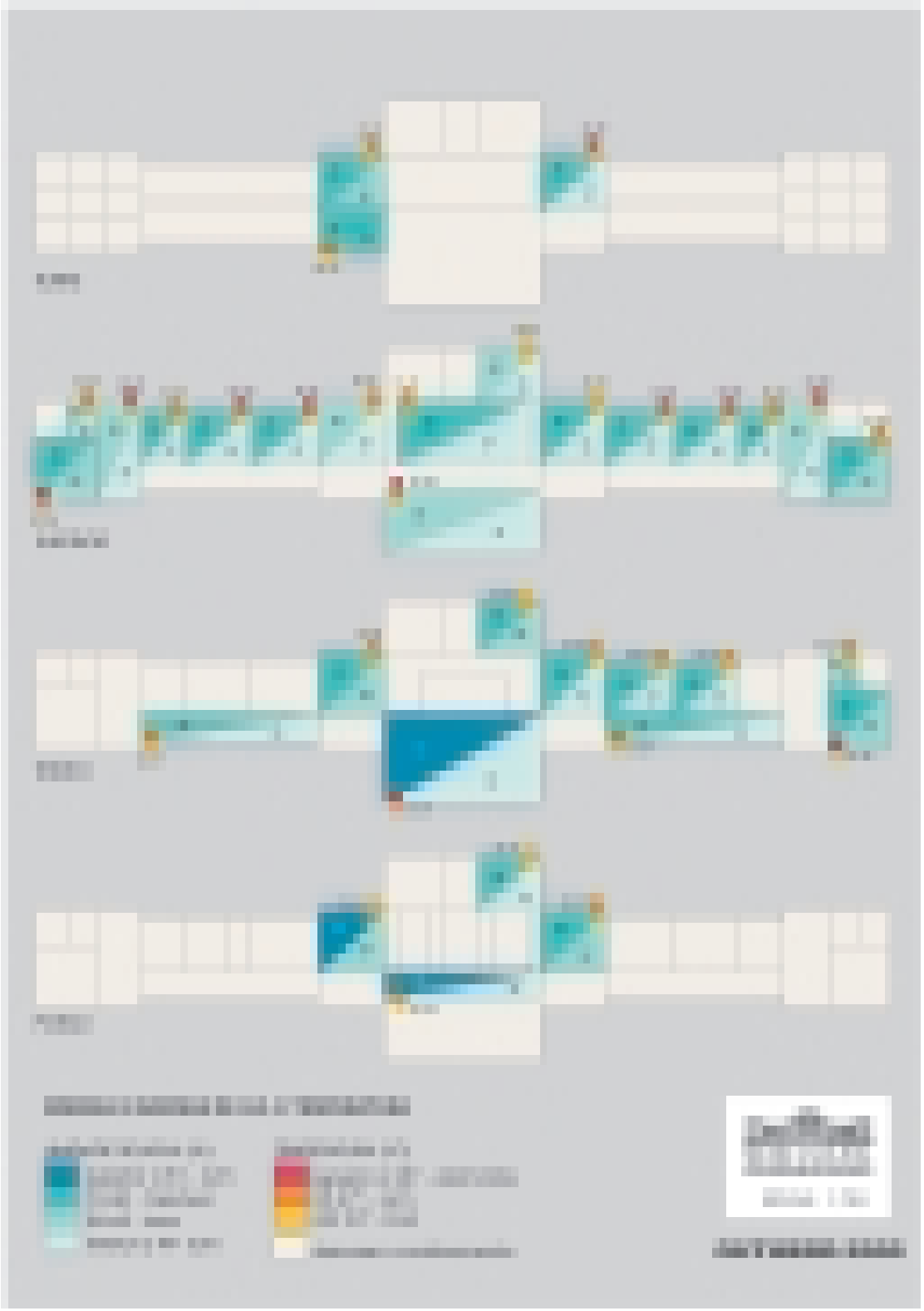


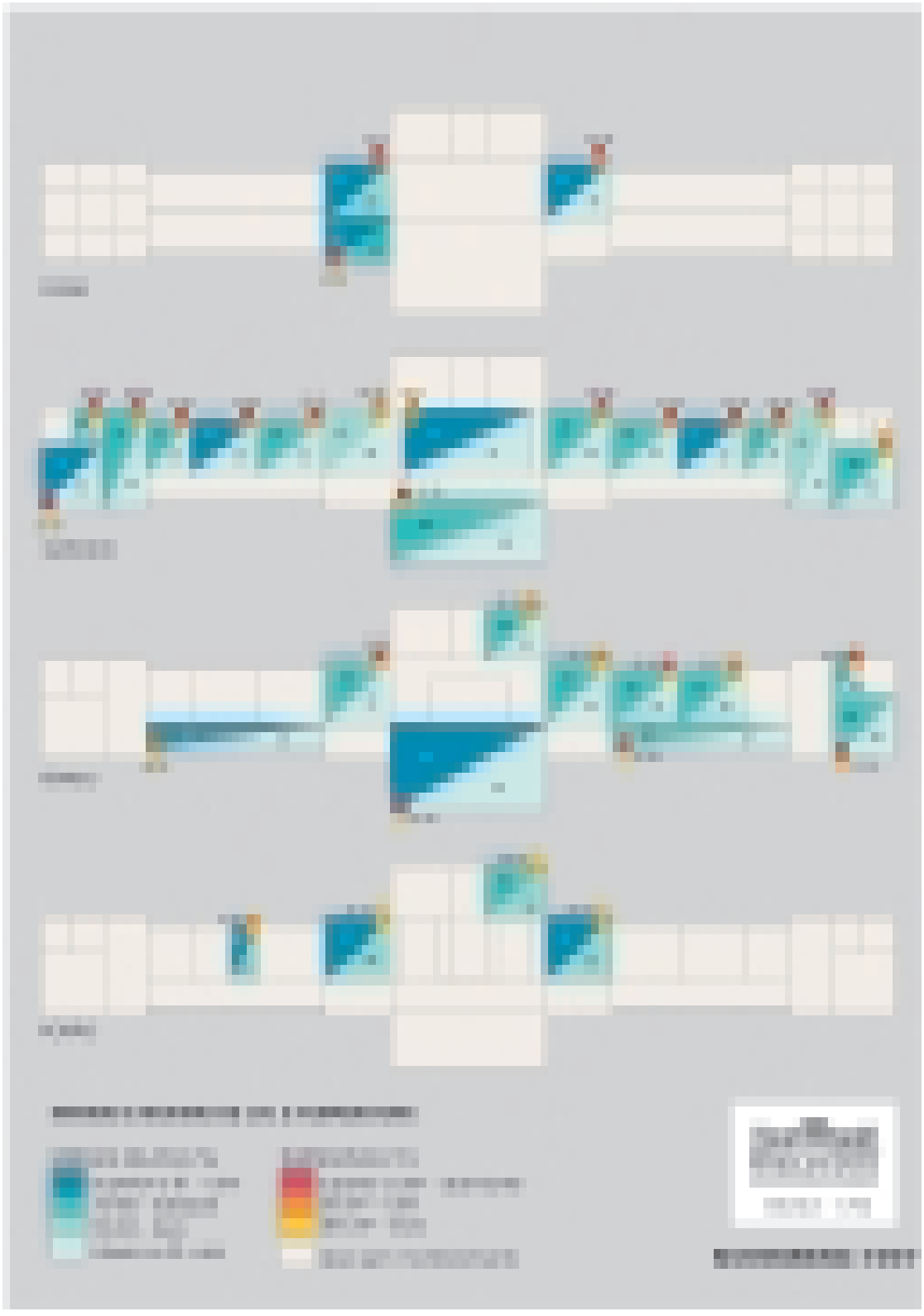


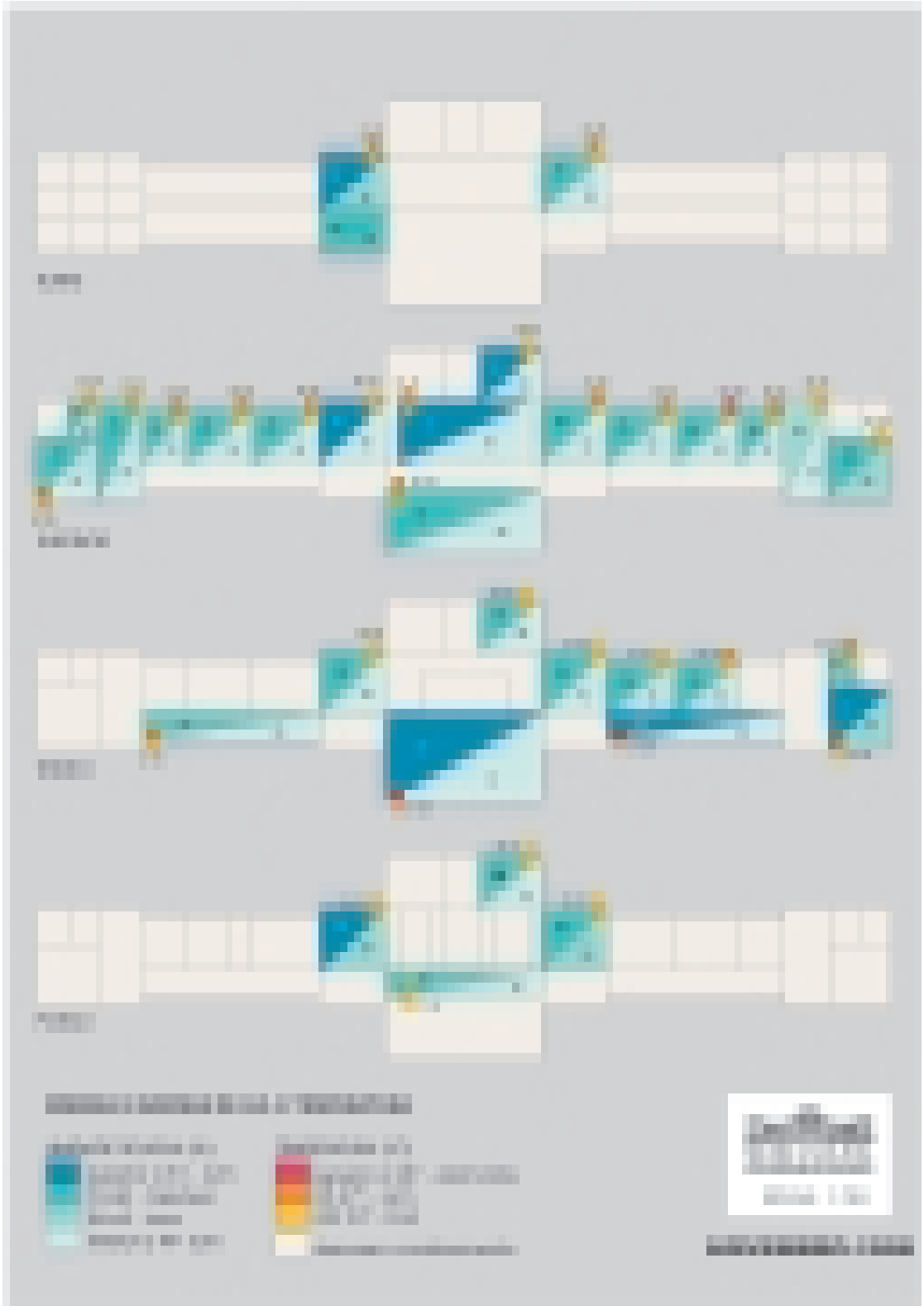


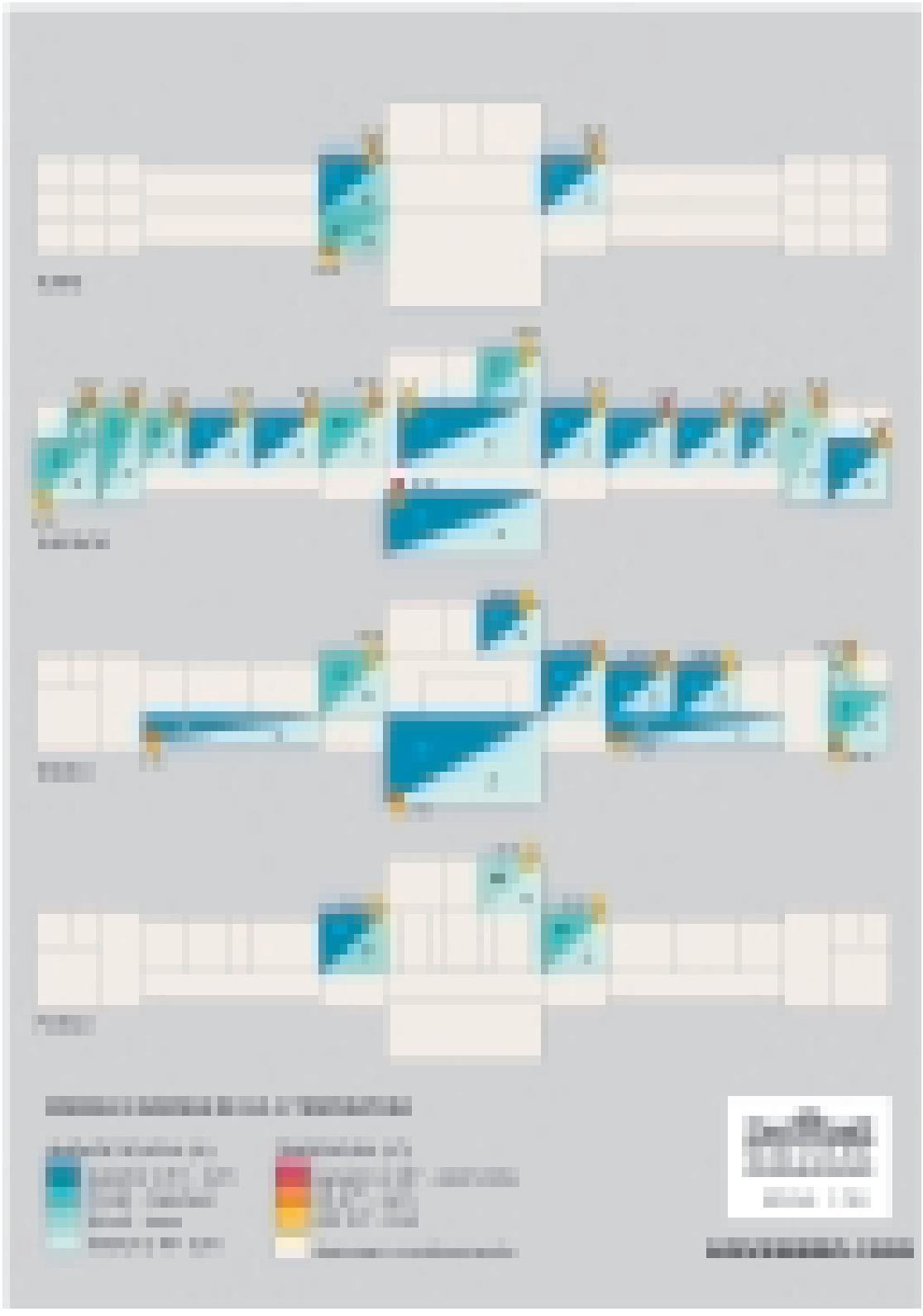


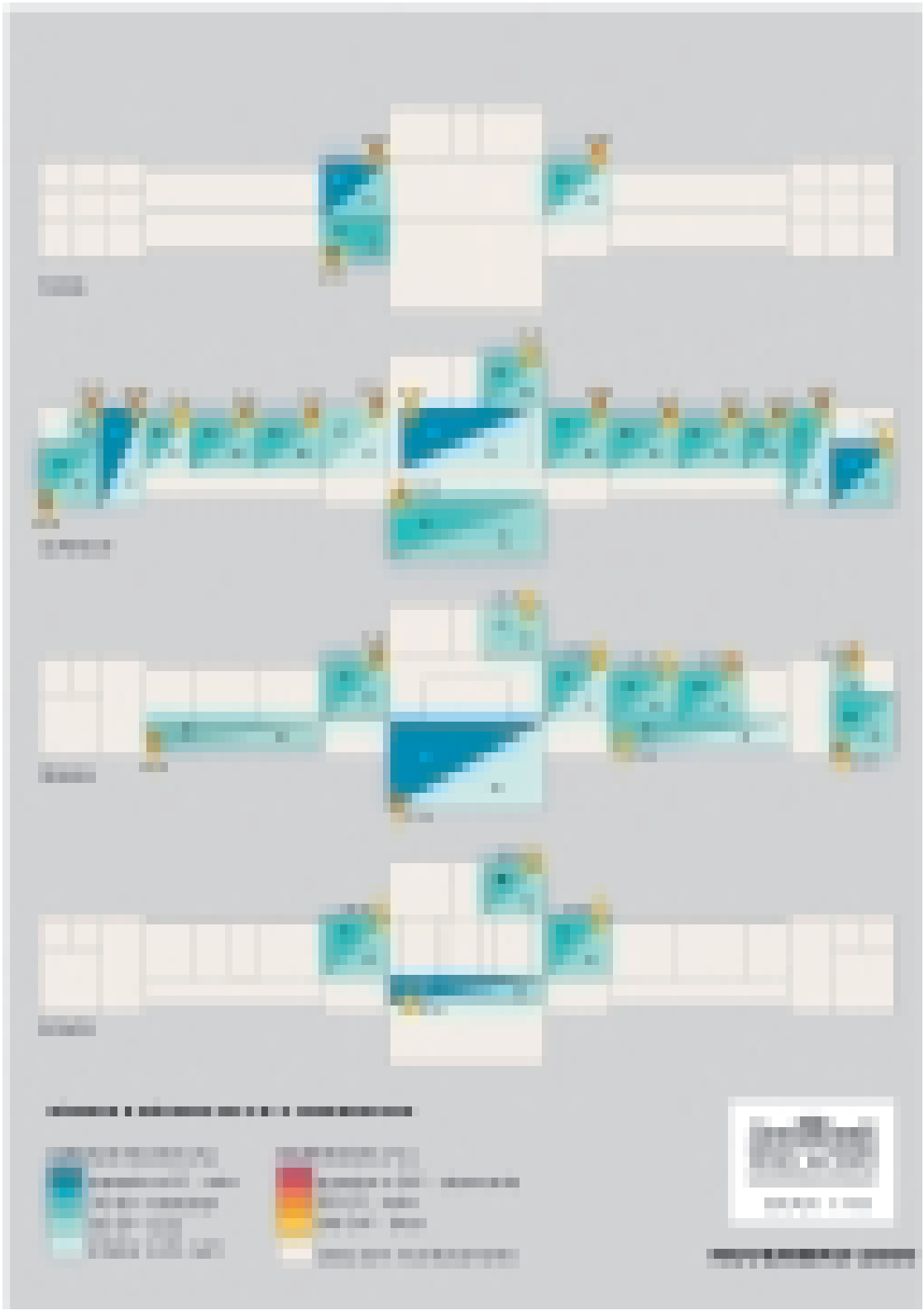


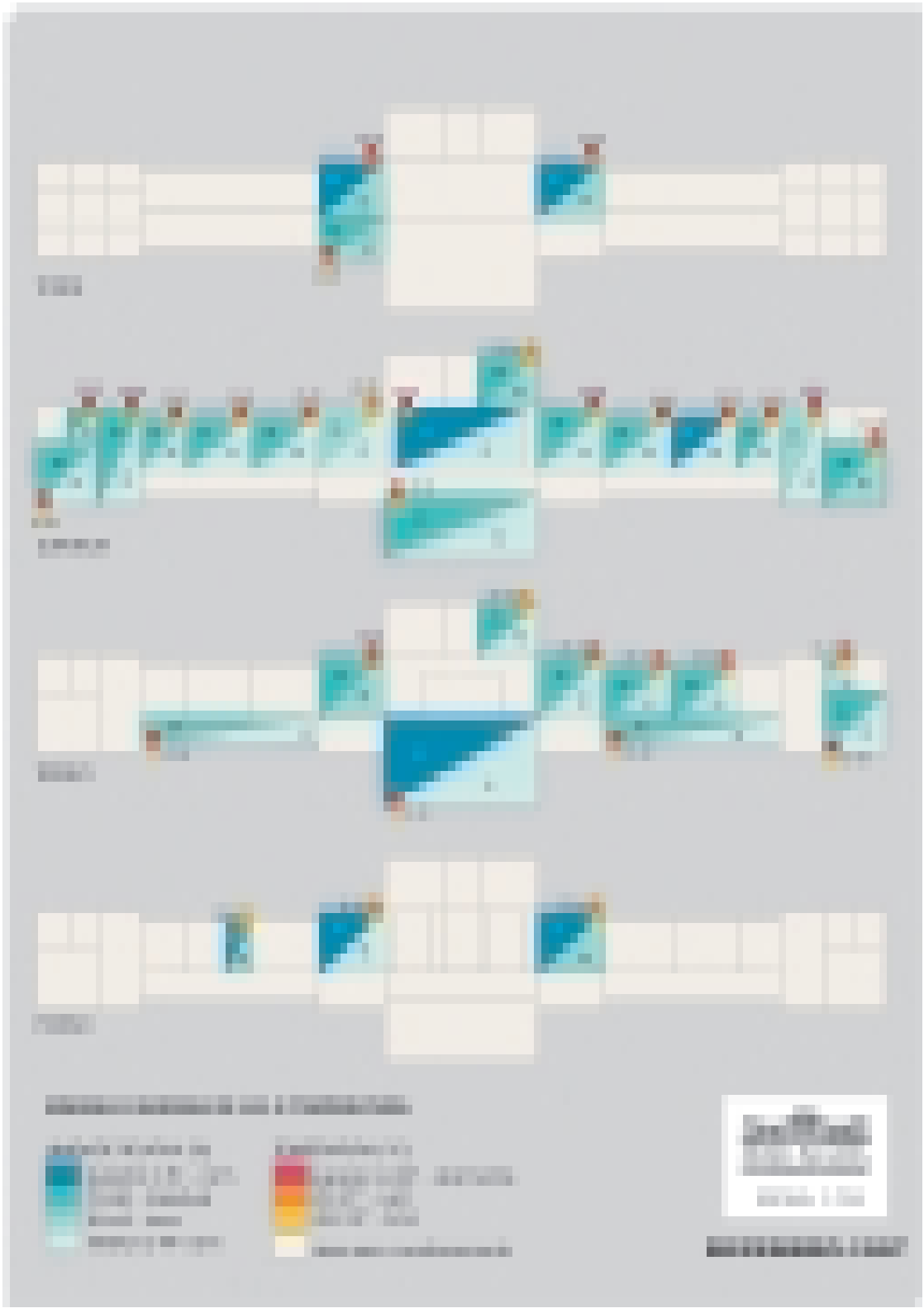


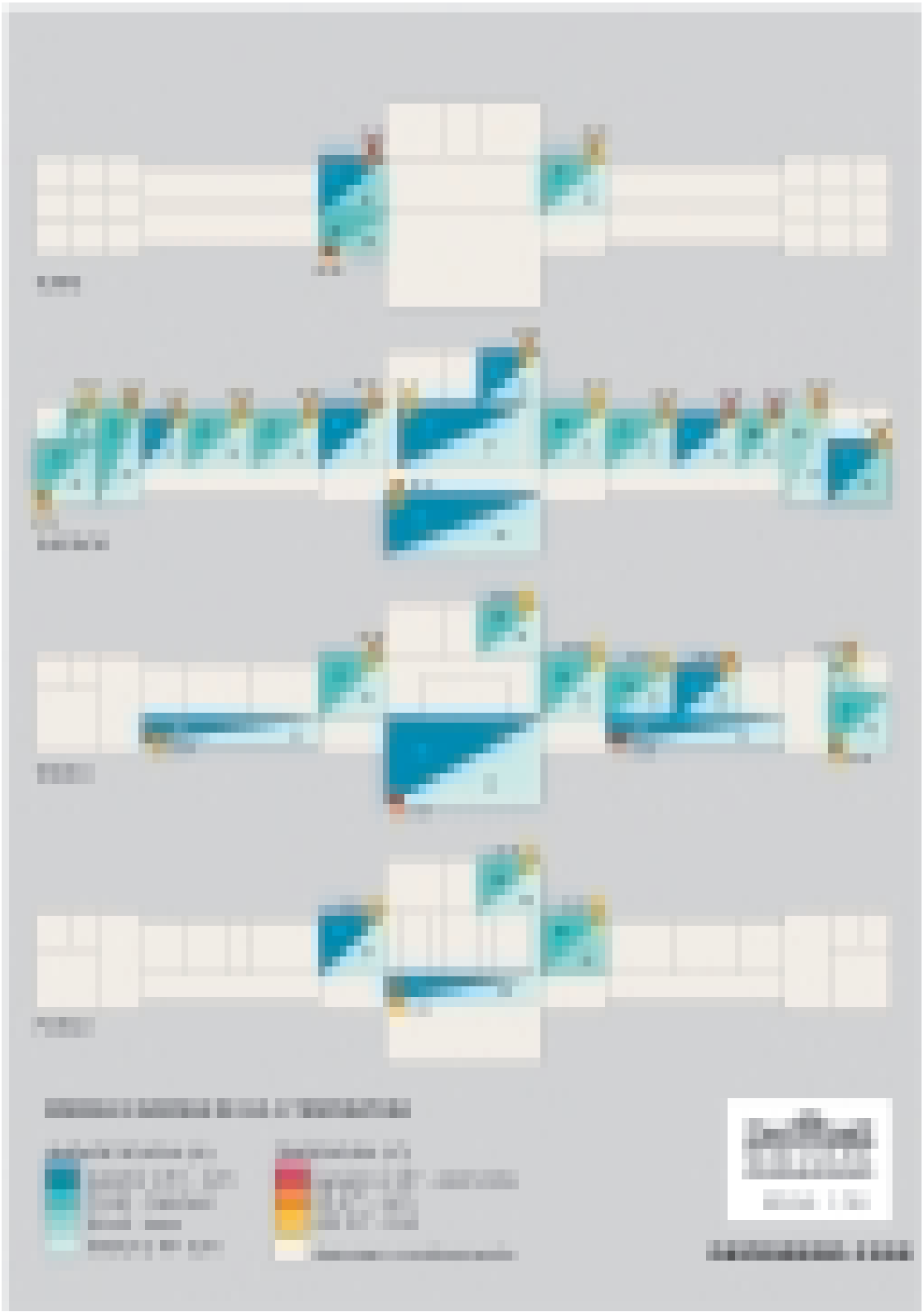


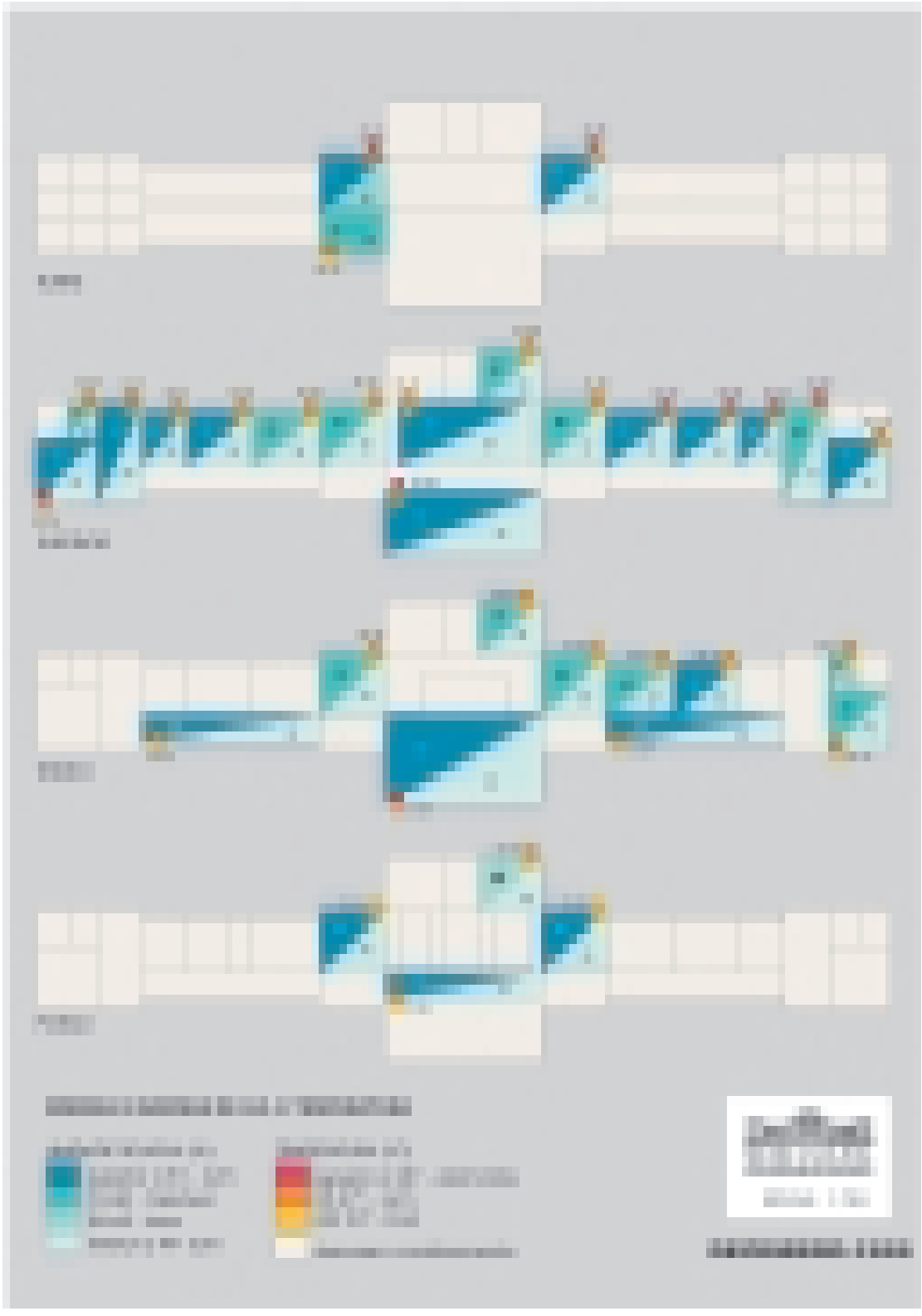


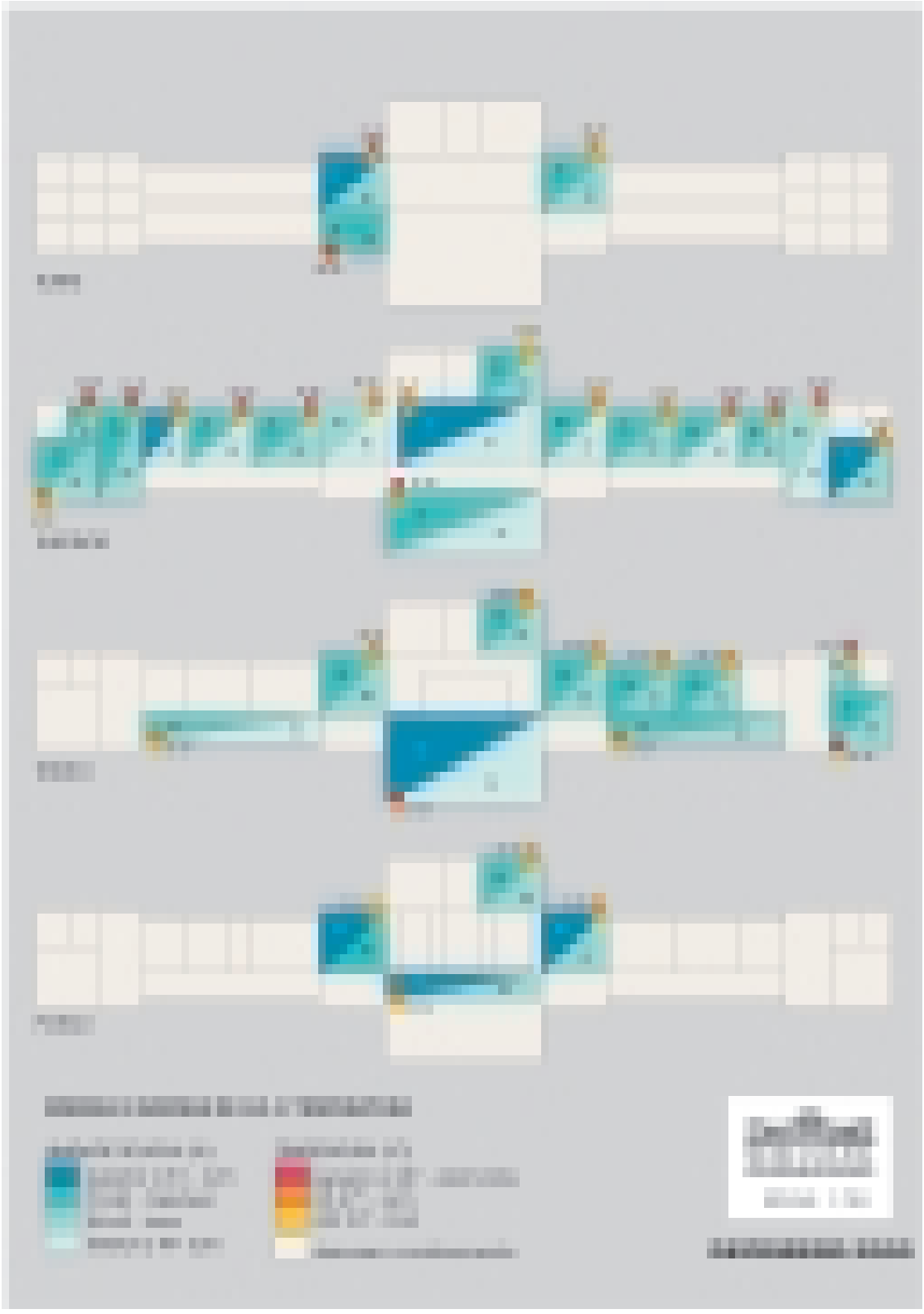












Influência da radiação de luz sobre acervos museológicos

Norma Ciaflone Cassares, Yara Lígia Mello Moreira

O texto analisa a ação e os efeitos da radiação de luz sobre acervo museológico. Considera-se a luz como fator de dano produzindo alterações físicas e químicas sobre a estrutura molecular dos materiais dos objetos, que ocorrem sempre em conjunto com as condições ambientais e não de forma isolada. Aponta critérios técnicos, referências, relativos aos níveis de iluminação e ao tempo de exposição dos objetos.
PALAVRAS-CHAVE: Conservação. Luz. Museus. Acervos.
Anais do Museu Paulista. São Paulo. N. Sér. v. 8/9. p.177-192 (2000-2001). Editado em 2003.

Influence of the light radiation on the museum's collections

Norma Ciaflone Cassares, Yara Lígia Mello Moreira

The text analyses the actions and effects of light on the museum's collections. Light is considered of harmful effects leading to physical and chemical changes on the molecular structure of the materials of the objects, which always happen together with the environmental conditions rather than alone. It points out towards technical criteria, references, related to the levels of light and the exposure time of the objects.
KEYWORDS: Conservation. Light. Museums. Collections.
Anais do Museu Paulista. São Paulo. N. Sér. v. 8/9. p.177-192 (2000-2001). Editado em 2003.

Conservação de coleções em ambientes tropicais: coletando e comunicando dados do Museu Paulista/USP, Brasil (1997-2000)

Teresa Cristina Toledo de Paula

As atividades de monitoramento e controle ambiental nas regiões temperadas originaram os parâmetros e práticas hoje estabelecidos mundialmente para a conservação de acervos; tais parâmetros e práticas, entretanto, podem não ser adequados à conservação de acervos em regiões tropicais. Este trabalho apresenta uma pesquisa sobre as condições ambientais em museu de região tropical, o Museu Paulista da Universidade de São Paulo. Trinta e três salas, *halls* e corredores nos quatro pavimentos do Museu Paulista têm sido monitorados por termo-higrógrafos desde 1997. Grandes variações na UR (30-98%) e temperatura (12-35 graus C) foram registradas. O efeito nocivo sobre as coleções, esperável em situações climáticas tão inconstantes, não foi encontrado onde há ventilação apropriada. O monitoramento possibilitou, também, a identificação de áreas de alto risco, onde ações localizadas podem ser introduzidas de forma econômica. Desenvolver um modo efetivo de comunicar essas informações ambientais à equipe do museu mostrou-se vital à implementação de medidas sustentáveis de monitoramento e controle climáticos.
PALAVRAS-CHAVE: Clima em Museu. Clima Tropical. Clima Brasileiro. Museus Brasileiros. Monitoramento Ambiental.
Anais do Museu Paulista. São Paulo. N. Sér. v. 8/9. p.193-278 (2000-2001). Editado em 2003.

Caring for Collections in Tropical Environments: Collecting and Communicating Data at Museu Paulista/USP, Brasil (1997-2000)

Teresa Cristina Toledo de Paula

The monitoring and environment control activities in the temperate regions have originated the parameters and the actions now established, world widely, for the conservation of the collections; such parameters and the actions, nevertheless, may not be adequate for the conservation of the collections in tropical regions. This work presents a research about the environmental conditions in a museum in a tropical region, the Museum of the University of São Paulo (*Museu Paulista da Universidade de São Paulo*). Thirty-three rooms, halls and corridors in the four of the museums floors have been monitored with thermo hygrographs since 1997. Huge variations in the UR (30-98%) and temperature (12-35 degrees C) have been registered. The harmful effect on the collections, expected in so changeable climatic situations, has not been found where there is proper ventilation. The monitoring has also enabled the identification of the high-risk areas, where local actions can be introduced in an economical way. Developing an effective way of passing ahead this environment information to the museum's staff has been proved vital for the implementation of sustainable measures of monitoring and climatic control.
KEYWORDS: Climate in a Museum. Tropical Climate. Brazilian Climate. Brazilian Museums. Environmental Monitoring.
Anais do Museu Paulista. São Paulo. N. Sér. v. 8/9. p.193-278 (2000-2001). Editado em 2003.