



COMPARATIVE SWOT ANALYSIS

Comparative SWOT Analysis for Indoor Air
Quality in schools located in Central
European countries based on National SWOT
analyses

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Table of Contents

- A. INTRODUCTION 4
- B. WHY IS IT NECESSARY TO CARRY OUT A SWOT ANALYSIS? 5
- C. WHAT IS A SWOT ANALYSIS 6
- D. COMPARATIVE SWOT ANALYSIS 7
- E. NATIONAL SWOT ANALYSES 12
 - E.1. HUNGARY 12
 - E.2. POLAND 15
 - E.3. SLOVENIA 18
 - E.4. CZECH REPUBLIC 21
 - E.5. ITALY 24
- F. APPENDIX: DEFINITIONS 27
 - F.1. STRATEGIC PLANNING DEFINITION AND BASIC CHARACTERISTICS 27
 - F.2. METHODOLOGY OF SWOT ANALYSIS 27
- G. ESSENTIAL BIBLIOGRAPHY 29
- H. SWOT ANALYSIS TOOL 30



A. Introduction

The aim of InAirQ project is to assess the indoor air quality in schools in selected countries of Central Europe. As people spend at least 18 hours of the 24 hours of a day indoor it is of crucial importance to ascertain good indoor air quality in schools where our children spend most of their time. Schools are the particularly indoor environment. Children are a population susceptible to air pollution because they respiratory system receive relatively higher doses of airborne particles than adult, classes are often overcrowding what influences on level of air pollution and from literature it is known that air quality in many schools worldwide, including Central Europe countries, is poor (Morawska et al, 2017).

There are important aspects which define the indoor air quality. The climatic conditions, the ambient concentration of air pollutants, the protective functions of the building envelope as well as the sources and sinks of indoor air pollutants all have an influence on the indoor air quality. The complexity of this environmental issue poses the question of how a healthy indoor environment can be achieved and maintained.

The InAirQ project is dedicated, among others, to assess the indoor air quality in primary school buildings and to take actions to ensure children`s health and well-being at school in Central Europe. In this light, national vulnerability assessments were prepared to review the quantitative and qualitative aspects of the primary school domain in the participating countries (Czech Republic, Hungary, Italy, Poland and Slovenia), the existing policies, i.e. officially adopted documents on indoor environment, as well as the previous experiences in the health risk assessment of the school environment. The partners analysed the national vulnerability situation and discussed the results of the analysis with national stakeholders on the meetings of the Environmental Quality Forum. Conclusions from these assessments gave a basis for the national SWOT analyses.



B. Why is it necessary to carry out a SWOT analysis?

A SWOT analysis can offer helpful perspectives at any stage of an effort, or preparation of measures. It can be used to:

- Explore possibilities for new efforts or solutions to problems.
- Make decisions about the best path for an initiative. Identifying one's opportunities for success in context of threats to success can clarify directions and choices.
- Determine where change is possible. An inventory of the strengths and weaknesses can reveal priorities as well as possibilities, and one can define the juncture or turning point.
- One can adjust and refine plans mid-course. A new opportunity might open wider avenues, while a new threat could close a path that once existed.

All above features of SWOT analysis simplify working out the new strategy or policy used to completely change or partly improve of the problematic area. Additionally the SWOT analysis can be convenient tool to pointing of the direction of the team discussion and brain storming. SWOT also offers a simple way of communicating about the initiative or program and an excellent way to organize information gathered from studies or surveys.



C. What is a SWOT Analysis

Strengths: internal positive attributes of the school environment that can facilitate activities aimed to improve the IAQ.

Weaknesses: internal attributes of the school environment that may hinder activities aimed to improve the IAQ.

Opportunities: external conditions that may facilitate activities aimed to improve the IAQ in schools.

Threats: external conditions that may complicate activities aimed to improve the IAQ in schools.

SWOT analysis is a method that can be used to evaluate the Strengths, Weaknesses, Opportunities, and Threats that exist in the case of indoor air quality (IAQ) in school buildings under the InAirQ project. To assess the school environment, SWOT analysis uses both internal and external factors that may have an impact on the IAQ.

The internal factors (strengths and weaknesses) are present within the school environment, while external factors (opportunities and threats) are beyond the schools. These critical factors, that may influence decision-making process directed to improve the IAQ in the schools, have to be identified in all PP countries/regions to use them as background to define the goals and objectives that have to be achieved in each PP country.

Each PP delivered SWOT analysis according to the methodology agreed by the PPs. It must be noted that the factors to be maintained are Strengths and Opportunities, while the factors to be addressed are the Weaknesses and Threats.

The presence of weaknesses and threats proves the existing gaps that have to be addressed in strategic planning (please find the definition below) to avoid or minimize their impact on the IAQ in the future. The absence of strengths and/or opportunities highlights the urgent need of further plans or developments before actions are taken to avoid weaknesses and threats.

According to the guidelines the partners have carried out their national SWOT analysis. The task of the lead partner was to compare the items of the national analyses in order to prepare a common assessment of the strengths, weaknesses, opportunities and threats. The comparative analysis should give a basis of the joint proposals how to solve the common problems. As each of the partners are members of the EU, the outcome of the analysis can be an initiative for a new legislation for controlling indoor air quality at EC level.



D. Comparative SWOT Analysis

The comparative SWOT analysis is prepared based on similarities between PPs. This approach will allow to develop the joint strategy and policy for IAQ in schools environment in CE countries.

	Internal analysis	
	STRENGTHS	WEAKNESSES
SWOT analysis tool	<p><i>What has a positive impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. The involvement of municipality, management, technical personnel and teachers. 2. The manager-owner is usually the same (for public schools) - the municipality. 3. The renovation of schools. 4. Classes are structurally separated from the changing rooms, dining room and gyms. 5. The location inside the city guarantees a good accessibility through public transport or other means. 6. Direct contact with the parents of the students. 	<p><i>What has a negative impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. Lack of finance. 2. Lack of staff (problem with cleaning staff). 3. Low awareness of indoor air quality and lack of efforts to improve IAQ. 4. Age of school buildings (old technologies and materials). 5. Lack of air conditioning system in classrooms. 6. Overcrowding of classes. 7. Ambient noise exposure. 8. Ambient air pollution. 9. Insufficient air exchange in classrooms in many schools (problems with



	<p>7. Good green infrastructure in the vicinity of schools (rather out of city centre).</p> <p>8. Municipal heating (the vast majority of schools).</p>	<p>ventilation ducts, lack of or only partial mechanical ventilation).</p> <p>10. Purchases of furniture and other interior furnishings for classrooms by the students' parents (eg. new school lockers, cabinet with shelves for students, tables for students, floor panels).</p>	
External analysis	<p style="text-align: center;">OPPORTUNITIES</p> <p><i>What are the opportunities to improve the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Inspection of schools by national supervisor institutions. 2. Post-inspection recommendations for IAQ improvement. 3. Ongoing process of thermo-modernization of schools in line with the EU directive (new technologies - HVAC, recuperation - and low emission materials. 4. Guidance and recommendations developed in the frame of projects aimed at improving the indoor air quality in schools. 5. Common access to the publication of the air quality, results of measurements of the quality of outdoor and indoor air, the 	<p style="text-align: center;">Opportunity-Strength (OS) Strategies</p> <p><i>How can we use Strengths to take advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Use of guidance and recommendations developed in projects aimed at improving the indoor air quality in schools. 2. Proper selection of materials and technological processes used in the thermo-modernization of the school. 3. Repair / clean the ventilation ducts during the thermo-modernization process. 4. The possibility of regulating the activity of children depending on outside air quality. 5. Introduction of proper cleaning technology: non-irritative cleaning chemicals, proper timing and frequency 	<p style="text-align: center;">Opportunity-Weakness (OW) Strategies</p> <p><i>How can we overcome Weaknesses by taking advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Promote the interest of founders and school leadership in improving IAQ. 2. Conducting of the literature review and disseminate selected publications among school personnel to raise awareness of air quality. 3. Educate school leaders and founders about the benefits and disadvantages of new technologies. 4. Optimization of the daily routine cleaning and thorough cleaning. Training and educating cleaning personnel about the proper technology of cleaning. 5. Reasonable updating of legislation and focusing on ongoing improvement in the framework of supervisory activities.



<p>impact of air pollution on human health, including children, and methods to reduce the levels of airborne pollution.</p> <p>6. Possibility of IAQ monitoring (microclimate sensors, pollutants monitoring).</p>	<p>of cleaning.</p> <p>6. Supervision activity focused on real and current air quality problems not only within the framework of legislation.</p> <p>7. Educate pupils, school staff and leadership in schools about IAQ and its influence on the health and attentions of children and teachers.</p> <p>8. Using modern technologies (such as sensors) to continually review IAQ status in schools.</p> <p>9. The possibility of regulating the activity of children depending on outside air quality.</p>	<p>6. Proper timing of painting the classrooms(or other renovation works) with water soluble paints.</p> <p>7. Detailed economic balance of possible measures with consideration and with respect to several factors (HVAC, recuperation), investment in sensors and personnel.</p> <p>8. Exert an influence on the choice of furniture and other finishing materials purchased by parents (eg. according to the recommendations developed in the indoor air quality projects or relevant publications).</p> <p>9. New furniture should be bought during summer and kept in rooms with proper ventilation.</p> <p>10. Foster new form of collaboration between schools and foundations/public entities aim to find funds or direct solutions.</p>
<p style="text-align: center;">THREATS</p> <p><i>What are the threats that can negatively influence the IAQ in the school environment?</i></p> <p>1. Surroundings of schools (industry, PM emission, agricultural field -spraying of</p>	<p style="text-align: center;">Threat-Strength (TS) Strategies</p> <p><i>How can we use Strengths to avoid Threats?</i></p> <p>1. Slow down the traffic at schools (eg. to apply to the local authorities about the installation of speed bumps on the road</p>	<p style="text-align: center;">Threat-Weakness (TW) Strategies</p> <p><i>How can we minimize weaknesses and avoid Threats?</i></p> <p>1. Raising awareness of the indoor air quality among the school staff and parents of students.</p>



	<p>pesticides, fertilizers, market places, car parking areas, railways).</p> <ol style="list-style-type: none"> 2. Urban planning regardless of the proximity of schools (transport, industry, etc.) that cause negative impact of changes. 3. Heavy traffic and infiltration of large amounts of pollution (PM) inside school environment from the outside. 4. Use of chalk boards. 5. Lack of current detailed regulations and requirements. 6. Insufficient information on how to improve IAQ. 7. Lack of interest by owners and school managers to improve IAQ beyond the legislative requirements. 8. Unregulated marketing pressure (cleaners, coatings, cleaning agents), unsubstantiated information on how to improve IAQ, the use of unverified technologies and products in schools. 9. Lack of funds for necessary repairs and installation of modern HVAC systems (or recuperation). 10. Low awareness of indoor air quality among the school management and parents (less parental pressure on the 	<p>in the school surrounding).</p> <ol style="list-style-type: none"> 2. Applying for the additional funds to the local self-government on the basis of the post-inspection recommendations of the National Sanitary Inspection. 3. Frequent cleaning and exact removal of layer of dust and selection of the right time for cleaning / minor repairs. 4. Define requirements for the placement of schools (support for and cooperation with grass-roots associations around schools). 5. Foster the exchange of air inside classroom (open windows). 6. Urban planning: define requirements for the placement of schools. 7. Ensuring capacities, technical assistance and resources for the necessary measures. 8. Discussion platform for communication between schools, Public Health Authorities and professionals and for obtaining validated information. 9. Conducting of the literature review and disseminate selected publications among parents to raise awareness of air quality. 10. Updating legislation in cooperation with experts (and school representatives). 	<ol style="list-style-type: none"> 2. Improvement of the involvement of school staff and parents to take actions towards the improvement of the quality of the indoor environment in schools. 3. Improve the level of awareness of staff and school founders - a discussion platform for communication between founders, schools, OECDs and professionals. The education of the founders of schools will increase the chances that they will understand the legitimacy of the requirements for the non-fulfillment of classes and staffing needs of schools. 4. To initiate national legislations on indoor air quality, to update national building regulations. 5. Promote new form of funding for ongoing status monitoring/air quality monitoring in schools. 6. Consistent application of the precautionary principle when introducing new technologies and products. 7. Call on policies on the significance of non-compliant IAQs in schools and on the need to secure funding for ongoing status monitoring / air quality
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	<p>school management).</p>		<p>monitoring in schools.</p> <p>8. In projects, optimize the exchange of air for individual parts of the building.</p> <p>9. Construction parameters: implement solutions aim to optimize the exchange of air for individual parts of the building.</p>
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E. National SWOT analyses

E.1. Hungary

	Internal analysis	
	STRENGTHS	WEAKNESSES
SWOT analysis tool	<p><i>What has a positive impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. The ownership of schools (the management can accelerate the renovation of buildings) 2. The involvement of management, technical personnel and teachers. 3. Municipal heating (the vast majority of schools). 4. Mean number of pupils is 20.2. 5. Renovation of buildings, windows (due to operational programs). 6. Direct contact with the parents of the pupils. 	<p><i>What has a negative impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. Low awareness of indoor air quality. 2. Age of school buildings. 3. Old water pipes containing lead. 4. Asbestos as insulation. 5. New furniture emitting VOCs, aldehydes. 6. Ambient noise exposure. 7. Overcrowding of classes. 8. Lack of the proper equipment to check the airflow value in the ventilation ducts. 9. Lack of air conditioning system in classrooms.



External analysis	OPPORTUNITIES	Opportunity-Strength (OS) Strategies	Opportunity-Weakness (OW) Strategies
	<p><i>What are the opportunities to improve the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. 1.5-year questionnaire survey of the Public Health Department of Governmental Agencies. 2. Inspection of schools by PH Depts. 3. Post-inspection recommendations of PH Depts. 4. Guidance and recommendations developed in the frame of projects aimed at improving the indoor air quality in schools. 5. Ongoing process of thermo-modernization of schools in line with the EU directive. 6. Common access to the publication of the air quality, results of measurements of the quality of outdoor and indoor air, the impact of air pollution on human health, including children, and methods to reduce the levels of airborne pollution. 	<p><i>How can we use Strengths to take advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Proper selection of materials and technological processes used in the thermo-modernization of the school. 2. Use of guidance and recommendations developed in projects aimed at improving the indoor air quality in schools. 3. Repair / clean the ventilation ducts during the thermo-modernization process. 4. The possibility of regulating the activity of children depending on outside air quality. 5. Observation of the incidence of respiratory diseases, allergies listed in the literature as associated with air pollution among pupils and undertaking of activities in case of increased morbidity among school children (e.g. in selected classes). 6. Introduction of proper cleaning technology: non-irritative cleaning chemicals, proper timing and frequency of cleaning. 	<p><i>How can we overcome Weaknesses by taking advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Frequent ventilation of classes (opening of the windows). 2. Proper timing of painting the classrooms with water soluble paints. 3. Optimization of the daily routine cleaning and thorough cleaning. 4. New furniture should be bought during summer and kept in rooms with proper ventilation. 5. Conducting of the literature review and disseminate selected publications among school personnel to raise awareness of air quality. 6. Training and educating cleaning personnel about the proper technology of cleaning.



<p style="text-align: center;">THREATS</p>	<p style="text-align: center;">Threat-Strength (TS) Strategies</p>	<p style="text-align: center;">Threat-Weakness (TW) Strategies</p>
<p><i>What are the threats that can negatively influence the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Surroundings of schools (industry, PM emission). 2. Heavy traffic. 3. Infiltration of the large amounts of PM into the inside school environment from the outside. 4. Lead exposure due to old water pipes. 5. Legal regulations in force - lack of detailed requirements for ensuring proper indoor air quality in the school classes. 6. Lack of funds for necessary repairs. 7. The schools belonging to the state are managed by one agency. 8. Lack of funds for the installation of modern HVAC systems. 9. Low awareness of indoor air quality among the school management. 10. 9. Low awareness of parents - less parental pressure on the school management. 	<p><i>How can we use Strengths to avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Proper selection of materials and technological processes used in the thermo-modernization of the school. 2. Use of guidance and recommendations developed in projects aimed at improving the indoor air quality in schools. 3. Repair / clean the ventilation ducts during the thermo-modernization process. 4. The possibility of regulating the activity of children depending on outside air quality. 5. Observation of the incidence of respiratory diseases, allergies listed in the literature as associated with air pollution among pupils and undertaking of activities in case of increased morbidity among school children (e.g. in selected classes). 6. 6. Introduction of proper cleaning technology: non-irritative cleaning chemicals, proper timing and frequency of cleaning. 	<p><i>How can we minimize weaknesses and avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Frequent ventilation of classes (opening of the windows). 2. Proper timing of painting the classrooms with water soluble paints. 3. Optimization of the daily routine cleaning and thorough cleaning. 4. New furniture should be bought during summer and kept in rooms with proper ventilation. 5. Conducting of the literature review and disseminate selected publications among school personnel to raise awareness of air quality. 6. 7. Training and educating cleaning personnel about the proper technology of cleaning.



E.2. Poland

		Internal analysis	
		STRENGTHS <i>What has a positive impact on the school environment regarding IAQ?</i>	WEAKNESSES <i>What has a negative impact on the school environment regarding IAQ?</i>
SWOT analysis tool		<ol style="list-style-type: none"> 1. The involvement of management, technical personnel and teachers. 2. The school chooses detergents used for cleaning. 3. Municipal heating (the vast majority of schools). 4. Direct contact with the parents of the students. 	<ol style="list-style-type: none"> 1. . Low awareness of indoor air quality. 2. Age of school buildings. 3. Overcrowding of classes. 4. Lack of the proper equipment to check the airflow value in the ventilation ducts. 5. Purchases of furniture and other interior furnishings for classrooms by the students' parents. 6. Own heating, boiler room on the school ground (few schools). 7. Lack of air conditioning system in classrooms.
External analysis	OPPORTUNITIES <i>What are the opportunities to improve the IAQ in the school environment?</i>	Opportunity-Strength (OS) Strategies <i>How can we use Strengths to take advantage of Opportunities?</i>	Opportunity-Weakness (OW) Strategies <i>How can we overcome Weaknesses by taking advantage of Opportunities?</i>
	<ol style="list-style-type: none"> 1. Post-inspection recommendations of the State Sanitary Inspection (Department of Hygiene of Children and Youth). 	<ol style="list-style-type: none"> 1. Proper selection of materials and technological processes used in the thermo-modernization of the school. 	<ol style="list-style-type: none"> 1. Frequent ventilation of classes (opening of the windows). 2. Exert an influence on the choice of



<ol style="list-style-type: none"> 2. Guidance and recommendations developed in the frame of projects aimed at improving the indoor air quality in schools. 3. Ongoing process of thermo-modernization of schools. 4. Common access to the publication of the air quality, results of measurements of the quality of outdoor and indoor air, the impact of air pollution on human health, including children, and methods to reduce the levels of airborne pollution. 	<ol style="list-style-type: none"> 2. Use of guidance and recommendations developed in projects aimed at improving the indoor air quality in schools. 3. Repair / clean the ventilation ducts during the thermo-modernization process. 4. The possibility of regulating the activity of children depending on outside air quality. 5. Observation of the incidence of respiratory diseases listed in the literature as associated with air pollution among pupils and undertaking of activities in case of increased morbidity among school children (eg. in selected classes). 	<p>furniture and other finishing materials purchased by parents (eg. according to the recommendations developed in the indoor air quality projects or relevant publications).</p> <ol style="list-style-type: none"> 3. Conducting of the literature review and disseminate selected publications among school personnel to raise awareness of air quality.
<p style="text-align: center;">THREATS</p> <p><i>What are the threats that can negatively influence the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Surroundings of schools (industry, low dust emission). 2. Heavy traffic. 3. Infiltration of the large amounts of dust into the inside school environment from the outside. 	<p style="text-align: center;">Threat-Strength (TS) Strategies</p> <p><i>How can we use Strengths to avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Selection of the right time for cleaning / minor repairs. 2. Frequent cleaning and exact removal of layer of dust. 3. Slow down the traffic at schools (eg. to apply to the local authorities about the installation of speed bumps on the road 	<p style="text-align: center;">Threat-Weakness (TW) Strategies</p> <p><i>How can we minimize weaknesses and avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Raising awareness of the indoor air quality among the school staff and parents of students. 2. Improvement of the involvement of school staff and parents to take actions towards the improvement of the quality of the indoor environment in schools.



	<ol style="list-style-type: none"> 4. Legal regulations in force - lack of detailed requirements for ensuring proper air parameters in school classes. 5. Lack of funds for necessary repairs. 6. Subordination to the local governments (different financial situation in individual municipalities of Poland). 7. Lack of funds for the installation of modern HVAC systems. 8. Low awareness of indoor air quality among parents participating in the cost of purchase interior and furniture materials. 	<p>in the school surrounding).</p> <ol style="list-style-type: none"> 4. Applying for the additional funds to the local self-government on the basis of the post-inspection recommendations of the National Sanitary Inspection. 5. Conducting of the literature review and disseminate selected publications among parents to raise awareness of air quality. 	
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E.3. Slovenia

		Internal analysis	
		STRENGTHS <i>What has a positive impact on the school environment regarding IAQ?</i>	WEAKNESSES <i>What has a negative impact on the school environment regarding IAQ?</i>
SWOT analysis tool		1. Municipal heating (the vast majority of schools). 2. Air conditioning in the schools of the capital. 3. Good green infrastructure in the vicinity of schools.	1. Age of school buildings. 2. Old water pipes containing lead. 3. Asbestos as insulation. 4. Hazardous chemicals used as cleaning substances. 5. Ambient noise exposure. 6. Partial mechanical ventilation.
External analysis	OPPORTUNITIES <i>What are the opportunities to improve the IAQ in the school environment?</i> 1. Additional renovation of the buildings. 2. New regulation to reduce traffic around the schools	Opportunity-Strength (OS) Strategies <i>How can we use Strengths to take advantage of Opportunities?</i> 1. Proper selection of materials and technological processes used in the thermo-modernization of the school. 2. Use of guidance and recommendations developed in projects aimed at improving the indoor air quality in schools. 3. Repair / clean the ventilation ducts during the thermo-modernization	Opportunity-Weakness (OW) Strategies <i>How can we overcome Weaknesses by taking advantage of Opportunities?</i> 1. Frequent ventilation of classes (opening of the windows). 2. Proper timing of painting the classrooms with water soluble paints. 3. Optimization of the daily routine cleaning and thorough cleaning. 4. New furniture should be bought during summer and kept in rooms with proper ventilation.



		<p>process.</p> <ol style="list-style-type: none"> 4. The possibility of regulating the activity of children depending on outside air quality. 5. Observation of the incidence of respiratory diseases, allergies listed in the literature as associated with air pollution among pupils and undertaking of activities in case of increased morbidity among school children (e.g. in selected classes). 6. Introduction of proper cleaning technology: non-irritative cleaning chemicals, proper timing and frequency of cleaning. 	<ol style="list-style-type: none"> 5. Conducting of the literature review and disseminate selected publications among school personnel to raise awareness of air quality. 6. Training and educating cleaning personnel about the proper technology of cleaning.
	<p style="text-align: center;">THREATS</p> <p><i>What are the threats that can negatively influence the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Surroundings of schools (industry, PM emission, agricultural fields, spraying of pesticides, fertilizers, markets places, car parking areas). 2. Heavy traffic, railway - noise exposure. 3. Infiltration of the large amounts of PM into the inside school environment from the outside. 	<p style="text-align: center;">Threat-Strength (TS) Strategies</p> <p><i>How can we use Strengths to avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Selection of the right time for cleaning / minor repairs. 2. Frequent cleaning and exact removal of layer of dust. 3. Slow down the traffic at schools. 	<p style="text-align: center;">Threat-Weakness (TW) Strategies</p> <p><i>How can we minimize weaknesses and avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Raising awareness of the indoor air quality among the school staff and parents of students. 2. Improvement of the involvement of school staff and parents to take actions towards the improvement of the quality of the indoor environment in schools.



	4. Lead exposure due to old water pipes.		
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E.4. Czech Republic

	Internal analysis	
	STRENGTHS	WEAKNESSES
<p>SWOT analysis tool</p>	<p><i>What has a positive impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. The location in the background sites, good building condition, increased use of low emission materials. 2. Classes are structurally separated from the changing rooms, dining room and gyms. 3. Education and availability of information on IAQ for school staff, interest in good IAQ. 4. Reasonable use of new technologies and materials. 5. The founder is predominantly public administration/municipality, schools have unified procedures and criteria for reconstruction and technology, communication and information transfer between schools and the founder. 	<p><i>What has a negative impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. Lack of finance, lack of staff. 2. Lack of efforts to improve IAQ. 3. Insufficient air exchange - caused by inconsistent access of staff, by the influence of school surroundings (disturbing noise, transport), pressure on energy-saving measures including reconstruction, by insufficient air volume per pupil in the classroom/s. 4. Insufficient awareness of the risks, current status and possibilities of IAQ improvement. 5. High physical activity in the classroom (during breaks). 6. Organizational shortcomings 7. Individual conditions of individual schools (not applicable everywhere)



External analysis	OPPORTUNITIES	Opportunity-Strength (OS) Strategies	Opportunity-Weakness (OW) Strategies
	<p><i>What are the opportunities to improve the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Legislative limits, follow-up supervision of Public Health Authorities, studies within the MZSO. 2. Capacity building, awareness-raising activities at the management and supervisory levels. 3. New technologies (HVAC, recuperation) and materials (cleaning agents, low emission materials) for schools. Possibility of IAQ control and management by schools (microclimate sensors, CO₂ ...). 4. Unification of practices and approaches to IAQ improvement, including regime measures, relevant use of funds. 5. Suitable placement of new school buildings, respecting the purpose of the building and IAQ requirements. 	<p><i>How can we use Strengths to take advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Using continuous legislative updates including requirements for materials for school facilities to improve the possibility of influencing air quality. 2. Supervision activity focused on real and current air quality problems not only within the framework of legislation. 3. Educate pupils, school staff and leadership in schools about IAQ and its influence on the health and attentions of children and teachers 4. Using modern technologies (such as sensors) to continually review IAQ status in schools. 5. Promote the interest of founders and school leadership in improving IAQ. 6. Sensitive application of new and proven technologies and materials. 	<p><i>How can we overcome Weaknesses by taking advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Reasonable updating of legislation and focusing on ongoing improvement in the framework of supervisory activities. 2. Faster reaction (awareness) of "marketing pressure on new technologies" and organizing educational seminars in schools for children, leadership and parents. 3. Detailed economic balance of possible measures with consideration and with respect to several factors (HVAC, recuperation), investment in sensors and personnel. 4. Educate school leaders and founders about the benefits and disadvantages of new technologies. 5. Individual approach to measures and design solutions for each school object. 6. Supporting pedagogical staff in the use of new methods and forms of education and training.
	THREATS	Threat-Strength (TS) Strategies	Threat-Weakness (TW) Strategies
	<p><i>What are the threats that can negatively influence the IAQ in the</i></p>	<p><i>How can we use Strengths to avoid Threats?</i></p>	<p><i>How can we minimize weaknesses and avoid Threats?</i></p>



<p><i>school environment?</i></p> <ol style="list-style-type: none"> 1. Outdated limits, slow response of legislation and public health authorities to actual issues. 2. More extensive reconstruction, comprehensive feasible concept, sufficient staffing capacity in schools. 3. Unregulated marketing pressure (cleaners, coatings, cleaning agents), unsubstantiated information on how to improve IAQ, the use of unverified technologies and products in schools. 4. Disinterest of founders and school management to improve IAQ beyond the legislative requirements. 5. Urban planning and construction regardless of the proximity of schools (transport, industry, etc.) - negative impact of changes (environmental pollution, noise, transport ...). 	<ol style="list-style-type: none"> 1. Updating legislation in cooperation with experts (and school representatives). 2. Define requirements for the placement of schools (support for and cooperation with grass-roots associations around schools). 3. Discussion platform for communication between schools, Public Health Authorities and professionals and for obtaining validated information. 4. Prohibition of using unverified technologies and inappropriate materials in schools 5. Ensuring capacities, technical assistance and resources for the necessary measures. 	<ol style="list-style-type: none"> 1. Improve the level of awareness of staff and school founders - a discussion platform for communication between founders, schools, OECs and professionals. The education of the founders of schools will increase the chances that they will understand the legitimacy of the requirements for the non-fulfillment of classes and staffing needs of schools. 2. Use all available options to improve IAQ (grants, funds ...). 3. Continuous evaluation of IAQ information. 4. Consistent application of the precautionary principle when introducing new technologies and products. 5. Call on policies on the significance of non-compliant IAQs in schools and on the need to secure funding for ongoing status monitoring / air quality monitoring in schools. 6. In projects, optimize the exchange of air for individual parts of the building. 7. Improve school funding.
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E.5. Italy

	Internal analysis	
	STRENGTHS	WEAKNESSES
<p>SWOT analysis tool</p>	<p><i>What has a positive impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. The location inside the city guarantees a good accessibility through public transport or other means. 2. Classrooms are always structurally separated from the refectory, play rooms and gyms. 3. Good availability of many information about IAQ for school staff, interested in good IAQ. 4. Great involvement of Turin city on the IAQ theme. 5. Big spaces and big windows in schools and classroom guarantees a lot of opportunities to adjust the climate inside. 6. The manager-owner is always the same: the municipality. 7. At least half of the school buildings were renovated during last 10 years (windows, insulation etc.). 	<p><i>What has a negative impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. Lack of finance 2. Lack of staff in cleaning service (number of employees is decreasing) 3. Lack of interest and efforts to improve IAQ. 4. Insufficient awareness of the risks and possible improvements in IAQ by staff and also by children parents. 5. Difficult air conditions inside school buildings - caused by insufficient air exchange especially during winter season, and by insufficient air volume per pupil in the classrooms. 6. Classrooms sometimes overcrowded. 7. Too much movement by children in the classroom (during breaks) that cause an air quality decay without a correct management of windows.



External analysis	OPPORTUNITIES	Opportunity-Strength (OS) Strategies	Opportunity-Weakness (OW) Strategies
	<p><i>What are the opportunities to improve the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Introduction of new legislative limits, follow-up supervision of Public Health Authorities, and continuous research on the subject. 2. Awareness-raising activities at staff-school level. 3. Introduction of new technologies and materials (cleaning agents, low emission materials) for schools following EU directives. 4. Possibility of IAQ control in schools (microclimate sensors, pollutants monitoring). 5. Collaboration with local foundation and the municipality to improve the situation and carry more pilot projects on IAQ in schools. 6. Improvement of city planning by the municipality: placement of new school buildings. 7. Guidance and recommendations developed in the frame of projects aimed at improving the indoor air quality in schools. 	<p><i>How can we use Strengths to take advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Introduction of legislative updates about IAQ in schools, including requirements for materials of school facilities. 2. Educate children, school staff and ownership in schools about IAQ and its influence on the health and attentions of children and teachers. 3. Promote the use of modern technologies to continually monitor and analyze IAQ status in schools. 4. Introduction of proper cleaning technology: non-irritating cleaning chemicals, proper timing and frequency of cleaning. 5. Better selection of materials and technological processes to renovate school buildings. 	<p><i>How can we overcome Weaknesses by taking advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Introduction of legislative updates about IAQ in schools, including requirements for materials of school facilities. 2. Introduction of proper cleaning technology: non-irritating cleaning chemicals, proper timing and frequency of cleaning. 3. Organizing educational seminars in schools for children and parents. 4. Educate children, school staff and ownership in schools about IAQ and its influence on the health. 5. Supporting school staff in use of new methods and forms of education and training. 6. Foster new form of collaboration between schools and foundations/public entities aim to find funds or direct solutions.



THREATS	Threat-Strength (TS) Strategies	Threat-Weakness (TW) Strategies
<p><i>What are the threats that can negatively influence the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Outdated legislation: old limits and need of new paradigms about IAQ. 2. Slow response of legislation and public health authorities to actual issues. 3. Different kind of restructuring, insufficient staffing capacity in schools. 4. Insufficient information on how to improve IAQ. 5. Disinterest of owners and school managers to improve IAQ beyond the legislative requirements. 6. Urban planning regardless of the proximity of schools (transport, industry, etc.) that cause negative impact of changes. 7. Heavy traffic and infiltration of large amounts of pollution inside school environment from the outside. 	<p><i>How can we use Strengths to avoid Threats?</i></p> <ol style="list-style-type: none"> 1. Update legislation in cooperation with experts and school representatives. 2. Urban planning: define requirements for the placement of schools. 3. School construction: prohibition of using unverified technologies and inappropriate materials in schools. 4. Ensuring capacities, technical assistance and resources for the necessary measures. 5. Foster the exchange of air inside classroom (open windows) and frequent cleaning and exact removal of dust. 	<p><i>How can we minimize weaknesses and avoid Threats?</i></p> <ol style="list-style-type: none"> 6. Use all available options to improve IAQ (collaboration between schools and foundations/public entities). 7. Improve the level of awareness of staff and school owners on the indoor air quality. 8. Consistent application of the precautionary principle when introducing new technologies and products. 9. Promote new form of funding for ongoing status monitoring/air quality monitoring in schools. 10. Construction parameters: implement solutions aim to optimize the exchange of air for individual parts of the building.



F. Appendix: definitions

F.1. Strategic planning definition and basic characteristics

According to Zaletel-Kragelj L. and Božikov J. (2010) there are several more or less similar definitions for strategic planning; two of them are:

- according to Geyer (2006), strategic planning is a process, by which an organization analyses whether it is effective in its goals and objectives, and it establishes whether the organization needs to change its direction to fulfill its purpose. Strategic planning helps to respond to the external environment in the most effective way.
- according to Lerner (1999), strategic planning is a complex and ongoing process of organizational change. It is based on thorough analysis of foreseen or predicted trends and scenarios of the possible alternative futures, as well as the analysis of internal and external data. It is a qualitative, idea driven process. It integrates soft data, not always supported quantitatively, such as experiences, intuition, and ideas, involves the organization in the ongoing dialogue, and aims to provide a clear organizational vision and focus. It is an ongoing, continuous learning process, an organizational dialogue, which extends beyond attaining a set of predetermined goals. It aims to change the way an organization thinks and operates, and create a learning organization.

F.2. Methodology of SWOT analysis

According to Zaletel-Kragelj L. and Božikov J. (2010):

1. The internal analysis is performed.

Internal analysis examines the advantages and drawbacks of school environment on the IAQ. This can be achieved by the analysis of the current state of school environment (Strengths and Weaknesses) and the impact of the school environment on the IAQ.

2. The external analysis is performed.

External analysis examines the main relevant points in the analysis of the actual state of policy-related factors which are independent of the schools (e.g. legislation in force, financial environment). They are identified as Opportunities or Threats or obstacles to be addressed in future.

3. Collected information (according to points 1 and 2) are used to fill the SWOT analysis tool in (enclosed table).
4. Properly performed SWOT analysis is needed to elaborate the strategy that applies Strength and Opportunities to reduce Weaknesses and Threats and



finally to achieve the goals and objectives of the InAirQ project (improvement of IAQ in school environment in Central European countries).

To conduct the SWOT analysis, we suggest taking the following parameters also into account:

- education policy;
- legislation(s) in force;
- financial environment;
- stakeholders (including authorities) involvement;
- current state of the applied technology (including building technology, HVAC systems, building finishing and furnishings);
- possibility of modern technology development and innovation (including building technology, HVAC systems, building finishing and furnishings);
- dissemination of knowledge and increase of awareness of schools management regarding to ensure the good IAQ ;
- trends in public health that may affect the IAQ.



G. Essential bibliography

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Lerner AL. *A Strategic planning primer for higher education*. Northridge: College of Business Administration and Economics, California State University; 1999. Available from URL: http://www.sonoma.edu/aa/planning/Strategic_Planning_Primer.pdf.

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H. SWOT Analysis tool

Improvement of the Indoor Air Quality in the school environment

Identify Strengths, Weaknesses, Opportunities and Threats but limit the points to a maximum of ten under each heading (Zaletel-Kragelj L. and Božikov J., 2010).

	Internal analysis	
	STRENGTHS	WEAKNESSES
SWOT analysis tool	<p><i>What has a positive impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. The involvement of management, technical personnel and teachers. ^{a)} 2. The school chooses detergents used for cleaning. ^{b)} 3. Municipal heating (the vast majority of schools). ^{c)} 4. Direct contact with the parents of the students. <p><i>^{a)} Please add more details, how management, technical personnel and teachers could be involved in the improvement of school environment.</i></p> <p><i>^{b)} Please give into account potential adverse impact of detergents on children</i></p>	<p><i>What has a negative impact on the school environment regarding IAQ?</i></p> <ol style="list-style-type: none"> 1. Low awareness of indoor air quality. 2. Age of school buildings^{l)} 3. Overcrowding of classes. ^{e)} 4. Lack of the proper equipment to check the airflow value in the ventilation ducts. 5. Purchases of furniture and other interior furnishings for classrooms by the students' parents. ^{f)} 6. Own heating, boiler room on the school ground (few schools). 7. Lack of air conditioning system in classrooms. ^{g)}



	<p><i>health.</i></p> <p><i>c) Please add type of heating (in some situation this point could be reported in Weaknesses).</i></p>	<p><i>d) Please add information about age.</i></p> <p><i>e) Please add information about average number of pupils and how big are average classrooms?</i></p> <p><i>f) If this point is true for your country please give examples.</i></p> <p><i>g) Please give percentage of schools with air conditioning system.</i></p>	
<p>External analysis</p>	<p style="text-align: center;">OPPORTUNITIES</p> <p><i>What are the opportunities to improve the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> 1. Post-inspection recommendations of the State Sanitary Inspection (Department of Hygiene of Children and Youth). 2. Guidance and recommendations developed in the frame of projects aimed at improving the indoor air quality in schools.^{g)} 3. Ongoing process of thermo-modernization of schools. 4. Common access to the publication of 	<p style="text-align: center;">Opportunity-Strength (OS) Strategies</p> <p><i>How can we use Strengths to take advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Proper selection of materials and technological processes used in the thermo-modernization of the school. 2. Use of guidance and recommendations developed in projects aimed at improving the indoor air quality in schools. 3. Repair / clean the ventilation ducts during the thermo-modernization process. 4. The possibility of regulating the 	<p style="text-align: center;">Opportunity-Weakness (OW) Strategies</p> <p><i>How can we overcome Weaknesses by taking advantage of Opportunities?</i></p> <ol style="list-style-type: none"> 1. Frequent ventilation of classes (opening of the windows). 2. Exert an influence on the choice of furniture and other finishing materials purchased by parents (e.g. according to the recommendations developed in the indoor air quality projects or relevant publications). 3. Conducting of the literature review and disseminate selected publications among school personnel to raise awareness of air quality.



	<p>the air quality, results of measurements of the quality of outdoor and indoor air, the impact of air pollution on human health, including children, and methods to reduce the levels of airborne pollution.</p> <p><i>^{g)} Please enclose guidance and recommendations to the SWOT analysis as annex.</i></p>	<p>activity of children depending on outside air quality.</p> <ol style="list-style-type: none"> 5. Observation of the incidence of respiratory diseases listed in the literature as associated with air pollution among pupils and undertaking of activities in case of increased morbidity among school children (e.g. in selected classes). 	
	<p style="text-align: center;">THREATS</p> <p><i>What are the threats that can negatively influence the IAQ in the school environment?</i></p> <ol style="list-style-type: none"> Surroundings of schools (industry, low dust emission). ^{h)} Heavy traffic. ^{h)} Infiltration of the large amounts of dust into the inside school environment from the outside. Legal regulations in force - lack of detailed requirements for ensuring proper air parameters in school classes. Lack of funds for necessary repairs. Subordination to the local governments 	<p style="text-align: center;">Threat-Strength (TS) Strategies</p> <p><i>How can we use Strengths to avoid Threats?</i></p> <ol style="list-style-type: none"> Selection of the right time for cleaning / minor repairs. Frequent cleaning and exact removal of layer of dust. Slow down the traffic at schools (e.g. to apply to the local authorities about the installation of speed bumps on the road in the school surrounding). Applying for the additional funds to the local self-government on the basis of the post-inspection recommendations of the National Sanitary Inspection. Conducting of the literature review and 	<p style="text-align: center;">Threat-Weakness (TW) Strategies</p> <p><i>How can we minimize weaknesses and avoid Threats?</i></p> <ol style="list-style-type: none"> Raising awareness of the indoor air quality among the school staff and parents of students. 2. Improvement of the involvement of school staff and parents to take actions towards the improvement of the quality of the indoor environment in schools.



	<p>(different financial situation in individual municipalities of Poland).</p> <p>7. Lack of funds for the installation of modern HVAC systems.</p> <p>8. Low awareness of indoor air quality among parents participating in the cost of purchase interior and furniture materials.</p> <p><i>^{h)} Please assess the percentage of schools with the problem.</i></p>	<p>disseminate selected publications among parents to raise awareness of air quality.</p>	
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