

LIFEINDEXAIR



Technical Report on Time Activity Patterns

Deliverable B2.1

April 2017

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NATIONAL CENTRE FOR SCIENTIFIC RESEARCH



NATIONAL INSTITUTE
FOR HEALTH AND WELFARE

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Introduction

The technical report on time activity patterns is a document of the LIFE Index-Air project, delivered in the context of the Action B2 – Implementation Actions, more specifically in Activity B2.1 – Assessment of time activity patterns in Lisbon.

Recently in the field of personal exposure studies, the individual daily activity and time spent have been greatly concerned. The information about activity and time spent provides benefit on the analysis of pollutant within microenvironment and plays a critical role for personal exposure to environmental pollutants.

IST developed a questionnaire about time activity patterns in the 2nd month of the project and applied it between the 3rd and the 7th month to the parents of the children from Lisbon. The main goal of the questionnaire on time activity patterns was to collect and analyze the time activity data of children (5-10 years-old) to get information about which kind of environment (home, school, commuting, outdoor, etc.) is attended during the weekday and weekend. Time activity patterns will be used to estimate the exposure experienced by children during a typical day, evaluated as a weighted exposure of the different pollutants levels of the most visited microenvironments.

Methodology

IST developed a questionnaire on time activity patterns in the 2nd month of the project and different strategies were put in force to achieve the target of 4000 questionnaires answered in Lisbon.

On-line questionnaire

Committed with the reduction of the project footprint, the questionnaire was developed through the google forms platform and was delivered online to the parents of the children. The online questionnaire can be found through the following link: <https://goo.gl/forms/g4RHQGvOf4WROJAm1>. Unfortunately, it was verified that only 42 parents answered the questionnaire. The parents complained that the questionnaire was very time consuming and that they didn't have access to a platform to answer the on-line questionnaire.

Paper questionnaire

A questionnaire in paper format (Annex 1) was drawn up and distributed in 24 schools to 6096 children (Table 1 and Figure 1). A pamphlet explaining the project and the action to be carried out in schools was also provided. This pamphlet is in Annex 2.

Table 1 - Schools where the questionnaire was distributed.

School	Parish	Total of Children
Colégio Alegria	Campo de Ourique	25
Colégio de Santa Maria	Lapa	208
Colégio João de Deus	Campo de Ourique	270
Colégio Pedro Arrupe	Parque das Nações	580
Colégio Valsassina	Chelas	350
EB1 Bairro São Miguel	Alvalade	400
EB1 Coruchéus	Alvalade	140
EB1 Dr. Catela Gomes	Moscavide	233
EB1 Santo António	Alvalade	200
EB1/JI Convento do Desagravo	Graça	277
EB1/JI Portela	Portela	393
EB1/JI Quinta da Alegria	Portela	226
Escola Básica n.º 1 de Telheiras	Lumiar	290
Escola Básica O Leão de Arroios	Arroios	390
Escola Básica Patrício Prazeres	Marvila	75
EB1 Oliveira Marques	Marvila	95
EB1 Rosa Lobato Faria	São Vicente	120
Escola São Vicente	Lumiar	130
Escola Vasco da Gama	Parque das Nações	200
Externato João XXIII	Parque das Nações	200
Externato Primário da Associação Pró-Infância Santo António de Lisboa	Arroios	180
Maristas	Benfica	270
Agrup. Padre Bartolomeu de Gusmão	Campo de Ourique	600
Jardim Escola João de Deus Olivais	Olivais	244



Figure 1 – Localization of the schools that participated in the project.

The response rate increased significantly comparing with the on-line version of the questionnaire but the response rate was still very low.

Awareness campaign "The air belongs to everyone"

To increase the interest of the school community and the response rate, the LIFE Index-Air project put into action the awareness campaign "The air belongs to everyone". This campaign was designed for students (5-9 years) and aimed to aware them to the problem of air quality. Sixty awareness sessions were made relied in a prezi presentation with a very engaging visual for the students. The presentation "The air belongs to everyone" is available for download on the project's website in 2 languages (Portuguese and English) at the following link: <http://www.lifeindexair.net/dissemination-materials/>. Around 4000 people (3800 students and 165 teachers) were reached and were invited to participate in the challenge "The air belongs to everyone", in which the students identified a set of behaviors that lead to an improvement of air quality at school, home and their region. Students presented the works developed within the challenge at Loures Inss, a fair on environment and sustainability organized by the Municipality of Loures. A film about the awareness campaign was produced and can be seen in <https://youtu.be/J2CWJG6SP6U>. More details can be consulted in the "Dissemination Dossier".

Contents of the questionnaire

The questionnaire, which can be consulted in Annex 1, was developed in two main parts:

- 1) Part 1 - characterization of the children and localization of their houses and schools.
- 2) Part 2 – characterization of the time activity pattern of children during the weekdays and weekends. The time was divided in periods of 30 minutes and 17 microenvironments were considered.

Results and discussion

During five months, 6096 questionnaires in paper format were delivered in 24 schools. 1251 of the parents returned the questionnaires, but only 1189 were completed, representing a response rate of 20%.

The questionnaires collected data on student characteristics such gender and age. The descriptive summary statistics in Table 3 show that the sample has 52% of female and 45% of male. The ages ranged from 5 to 10 years, with 5.7% of children aged 5 years, 14% with 6 years, 21% with 7 years, 21% with 8 years, 24% with 9 years and 13% with 10 years of age.

Table 3: Descriptive characteristics of student gender and age.

Variable	Description	Statistics
Gender	Male	533 (45%)
	Female	612 (52%)
	Unknown	44 (3.7%)
Age	5	68 (5.7%)
	6	160 (14%)
	7	251 (21%)
	8	250 (21%)
	9	285 (24%)
	10	153 (13%)
	Unknown	22 (1.8%)

The questionnaires included activity-time use patterns classified according 2 main groups: Indoor and Outdoor (Table 4).

Table 4: Classification of the microenvironments.

Indoor	Home	
	Classroom	School
		Extra-curriculum activities
	Physical Activity Indoor	Gymnasium
		Swimming-pool
	Leisure	Shop/supermarket
		Cinema/theatre
		Restaurant/coffee
	Transports	Bus
		Train
		Metro
		Car
Outdoor	School	
	Physical activity	

Street
Garden/park/esplanade
Beach

The time activity pattern for weekdays and weekends is presented in Table 5 and Figure 2.

Table 5: Time activity pattern of children aged between 5 and 9 years old from Lisbon.

	Week		Weekend	
	Minutes	%	Minutes	%
Indoor	1277	89	1252	87
Home	795	55	1093	76
Classroom	384	27	11	0.70
School	367	26	2.5	0.17
Extra-curriculum activities	17	1.2	8.0	0.56
Physical activity	39	2.7	20	1.4
Gymnasium	25	1.7	11	0.74
Swimming-pool	14	1.0	9.3	0.65
Leisure	9.4	0.70	78	5.4
Shop/supermarket	3.5	0.20	24	1.7
Cinema/theatre	0.90	0.10	22	1.5
Restaurant/coffee	5.0	0.30	34	2.4
Transports	50	3.5	50	3.4
Outdoor	146	10	136	9.4
School	108	7.5	1.5	0.10
Physical activity	16	1.1	24	1.6
Street	17	1.1	45	3.1
Garden/park/esplanade	4.4	0.30	61	4.2
Beach	0.30	0.0	3.8	0.30
Other	7.7	0.50	38	2.6

Results show that during the week children spend 89% of their time indoors - 56% in home, 27% in classrooms, 3.5% in vehicles and 2.7% practicing indoor physical activities. The majority of the children are at home between 19:00 and 8:00 and at school between 8:30 and 16:30.

During the weekends the time spent indoors slightly reduce to 87% - 76% in home, 5.4% in leisure indoor activities, 3.4% in transports, and 1.4% practicing indoor physical activities.

The time spent outdoor is 10% during the week and 9.4% during the weekend.

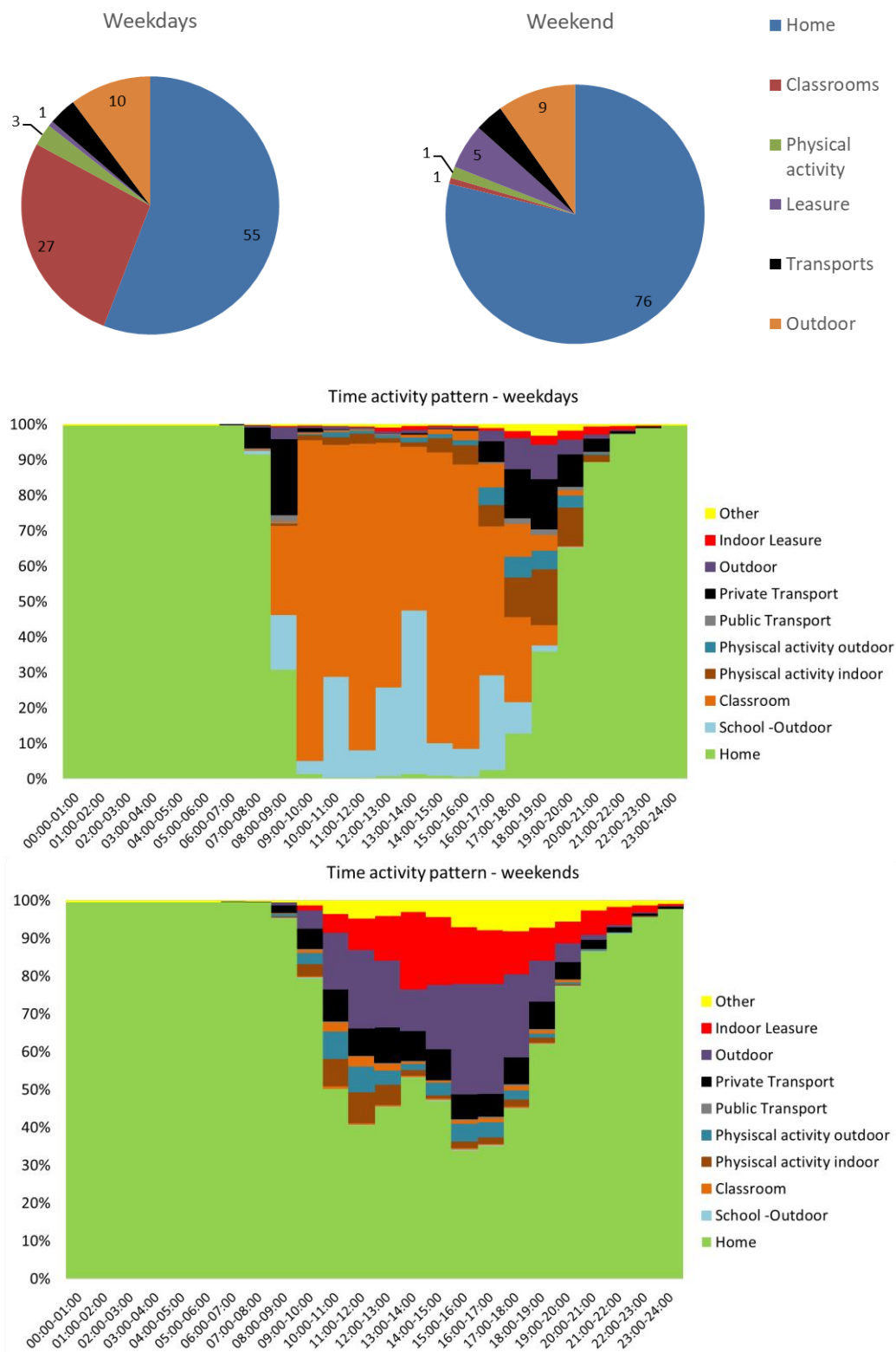


Figure 2: Time activity pattern of children aged between 5 and 9 years old from Lisbon.

Children exposure to ambient air pollutants occurs in the different microenvironments, and the levels of exposure depend on the fractions of time the children spends in the various indoor and outdoor microenvironments, as well as the concentrations of air pollutants in those microenvironments. To calculate the children exposure, the LIFE Index-Air tool will use, for each 30 minutes, the place where the majority of the children are (Table 6).

Table 6: Time occupancy during the weekday and weekend to be considered by the LIFE Index-Air tool for the calculation of the children exposure.

Time	Weekday	Weekend
00:00 - 00:30	Home	Home
00:30 - 01:00	Home	Home
01:00 - 01:30	Home	Home
01:30 - 02:00	Home	Home
02:00 - 02:30	Home	Home
02:30 - 03:00	Home	Home
03:00 - 03:30	Home	Home
03:30 - 04:00	Home	Home
04:00 - 04:30	Home	Home
04:30 - 05:00	Home	Home
05:00 - 05:30	Home	Home
05:30 - 06:00	Home	Home
06:00 - 06:30	Home	Home
06:30 - 07:00	Home	Home
07:00 - 07:30	Home	Home
07:30 - 08:00	Home	Home
08:00 - 08:30	Transports	Home
08:30 - 09:00	School Indoor	Home
09:00 - 09:30	School Indoor	Home
09:30 - 10:00	School Indoor	Home
10:00 - 10:30	School Indoor	Home
10:30 - 11:00	School Outdoor	Physical activity outdoor
11:00 - 11:30	School Indoor	Physical activity indoor
11:30 - 12:00	School Indoor	Indoor Supermarket
12:00 - 12:30	School Indoor	Transports
12:30 - 13:00	School Outdoor	Transports
13:00 - 13:30	School Outdoor	Home
13:30 - 14:00	School Outdoor	Restaurant
14:00 - 14:30	School Indoor	Home
14:30 - 15:00	School Indoor	Outdoor street
15:00 - 15:30	School Indoor	Outdoor street
15:30 - 16:00	School Indoor	Indoor Cinema theatre
16:00 - 16:30	School Indoor	Outdoor garden/park
16:30 - 17:00	Physical activity outdoor	Outdoor garden/park
17:00 - 17:30	Outdoor street	Home
17:30 - 18:00	Transports	Home
18:00 - 18:30	Physical activity indoor	Home
18:30 - 19:00	Physical activity swimming pool	Home
19:00 - 19:30	Home	Home
19:30 - 20:00	Home	Home
20:00 - 20:30	Home	Home
20:30 - 21:00	Home	Home
21:00 - 21:30	Home	Home
21:30 - 22:00	Home	Home
22:00 - 22:30	Home	Home
22:30 - 23:00	Home	Home
23:00 - 23:30	Home	Home
23:30 - 24:00	Home	Home

Once the target value of 4000 children was not achieved due to the low response rate, the time activity patterns for a subsample of 500 children was analysed and compared with the time activity pattern for 1189 children. Results presented in Annex 3 show that the ratio for the microenvironments where the children spend more time (home, school-classroom, school-outdoor and transports) varies between 0.9 and 1.1 indicating a great homogeneity in the answers. Therefore, it was considered that the reduction of the sample didn't compromise the characterization of the children's activity pattern.

Conclusion

IST developed a questionnaire on time activity patterns of children and different strategies were put in force to achieve the target of 4000 questionnaires answered in Lisbon. A total of 6096 questionnaires were delivered, but besides the efforts to increase the response rate, only 1251 of the parents returned the questionnaires and only 1189 were completed (response rate of 20%).

The most important finding of the survey was that children spend more than 87% of their time indoors indicating that risk assessment should focus on indoor microenvironments. During the week children spend 89% of their time indoors - 55% in home, 27% in classrooms, 3.5% in vehicles and 2.7% practicing indoor physical activities. During the weekends the time spent indoors slightly reduce to 87% - 76% in home, 5.4% in leisure indoor activities, 3.4% in transports, and 1.4% practicing indoor physical activities. The time spent outdoor is 10% during the week and 9.4% during the weekend.

Annex 1: Questionnaire on Time Activity Patterns



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Este projeto é financiado pela União Europeia

QUESTIONÁRIO INDIVIDUAL SOBRE PADRÕES DE TEMPO-ATIVIDADE DAS CRIANÇAS

O projeto **LIFE Index-Air** pretende **avaliar e diminuir a exposição a poluentes atmosféricos de crianças**, com idades compreendidas entre 5 e 9 anos, que vivem na região de Lisboa. A avaliação da exposição a poluentes será efetuada em duas etapas:

Etapla 1: Estudo dos padrões de tempo-atividade das crianças através da aplicação de um questionário;

Etapla 2: Estudo da qualidade do ar dos microambientes que mais contribuem para a exposição das crianças através de medições de poluentes em casas, escolas e transportes.

No âmbito deste trabalho o **Instituto Superior Técnico** vem pedir a colaboração dos pais para o preenchimento deste questionário que será um instrumento de máxima relevância para a Etapa 1 do nosso trabalho.

Toda e qualquer informação fornecida terá completa confidencialidade.

Desde já, agradecemos a sua colaboração e disponibilizamo-nos para prestar qualquer esclarecimento.

Contacto:

Equipa do projeto LIFE Index-Air
life-index-air@ctn.tecnico.ulisboa.pt

Marta Almeida

Tel: 219946124

Campus Tecnológico de Loures

Estrada Nacional 10

2695-066 Bobadela LRS

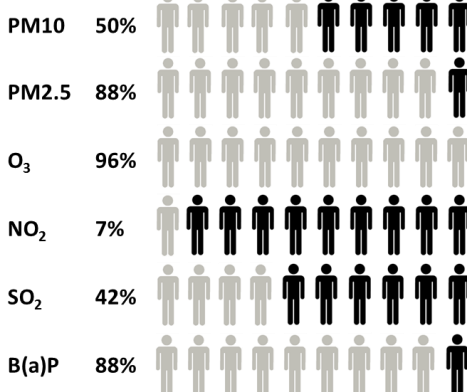
Portugal



www.facebook.com/LIFEIndexAir/

Sabia que:

90 % dos Europeus que vivem em zonas urbanas estão expostos a níveis de poluentes atmosféricos considerados prejudiciais para a saúde.



População exposta a concentrações superiores às diretrizes definidas pela Organização Mundial de Saúde

QUESTIONÁRIO INDIVIDUAL SOBRE PADRÕES DE TEMPO-ATIVIDADE DAS CRIANÇAS

Nome (facultativo): _____

Data de Nascimento: dd / mm / ano

Género: ☐ Feminino ☐ Masculino

Código Postal da Residência: _____ - _____

Freguesia da Residência: _____

Escola: _____

Freguesia da Escola: _____

Estou interessado em participar na Etapa 2 do estudo, permitindo a realização da avaliação da qualidade do ar em minha casa durante 5 dias. Para esse efeito forneço os meus dados de contacto:

☐ Sim ☐ Não

Estou interessado em receber a Newsletter LIFE Index-Air com informação sobre os resultados do projeto. Para esse efeito forneço os meus dados de contacto.

☐ Sim ☐ Não

E-mail: _____

Telefone/Telemóvel: _____

CARACTERIZAÇÃO DE HÁBITOS INDIVIDUAIS

1) Para responder às seguintes questões selecione um dia de semana (segunda-feira a sexta-feira) e um dia de fim-de-semana (sábado ou domingo).

2) Para preencher a tabela, deverá assinalar o local onde a criança se encontrava às horas indicadas.

3) Se durante o período de tempo indicado a criança se encontrava em mais do que um local, assinale os locais em questão.

4) Se considerar que nenhuma das opções se adequa, assinale no campo “Outro” o local onde a criança se encontrava.



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Dia de Semana: dd / mm / ano

	[A] Casa	[B] Escola - Exterior	[C] Escola - Interior	[D] Ativ. física - interior (ginásio/pavilhão)	[E] Ativ. física - interior (piscina)	[F] Ativ. física - exterior	[G] Ativ. extra-curricular em sala	[H] Transp. público - Autocarro	[I] Transp. Público - Comboio	[J] Transp. Público - Metro	[K] Transp. Privado - Carro	[L] Transp. Privado - Mota	[M] Espaço Ext. Rua	[N] Espaço Ext. - Jardim/ Esplanada/ Parque	[O] Espaço Ext. - Praia	[P] Espaço Interior - Loja/ Supermercado	[Q] Espaço Interior - Cinema/ Teatro	[R] Espaço Interior - Restaurante / Café	[S] Outro
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Fim-de-Semana: dd / mm / ano

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Annex 2: Pamphlet distributed with the questionnaire

NAS ESCOLAS

- As escolas do 1º ciclo, localizadas no distrito de Lisboa, são convidadas a participar no projeto LIFE Index-Air.
- Nas escolas aderentes realizar-se-á uma avaliação da qualidade do ar interior.
- O relatório técnico com os resultados das avaliações e com um guia de boas práticas será fornecido às escolas.
- Os padrões de atividade-tempo das crianças se-rão avaliados através da aplicação de um questionário.
- A equipa do projeto fará sessões de sensibilização para os alunos sobre a importância da qualidade do ar e lançará o desafio "O ar é de todos", no qual os alunos deverão identificar um conjunto de comportamentos conducentes à melhoria da qualidade do ar na escola, em casa e na sua região.
- Os trabalhos desenvolvidos serão apresentados numa exposição a realizar no dia 5 de junho, no dia Mundial do Ambiente, e os melhores trabalhos serão premiados.

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PARA MAIS INFORMAÇÕES CONTACTAR
A EQUIPA DO PROJETO LIFE INDEX-AIR



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WWW.FACEBOOK.COM/LIFEINDEXAIR



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CAMPUS TECNOLÓGICO E NUCLEAR
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LIFEINDEXAIR

DESENVOLVIMENTO DE UMA
FERRAMENTA INTEGRADA PARA
REDUZIR A EXPOSIÇÃO A PARTÍCULAS
EM SUSPENSÃO NO AR

APRESENTAÇÃO
DO PROJETO
LIFE INDEX-AIR
ÀS ESCOLAS



IMPLEMENTAÇÃO DA FERRAMENTA
EM 5 CIDADES EUROPEIAS
LISBOA, PORTO, ATENAS, KUOPIO E TREVISO

ESTE PROJECTO É FINANCIADO PELA UNIÃO EUROPEIA

PROJETO LIFE INDEX-AIR

LIFE15 ENV/PT/000674

O Projeto LIFE Index-Air, coordenado pelo Centro de Ciências e Tecnologias Nucleares (C2TN) do Instituto Superior Técnico (IST), foi recentemente aprovado no âmbito do programa LIFE no eixo prioritário Ambiente e Eficiência de Recursos. Este programa é o instrumento financeiro da União Europeia que apoia projetos na área do ambiente, conservação da natureza e clima.

Este projeto pretende desenvolver uma ferramenta inovadora e versátil de apoio à decisão, que permitirá identificar medidas de melhoria da qualidade do ar e avaliar quantitativamente os impactos dessas medidas não só na qualidade do ar, mas também no bem-estar e saúde da população.

A implementação desta ferramenta em 5 cidades europeias – Lisboa, Porto, Atenas, Kuopio e Veneza – irá demonstrar a sua aplicabilidade para:

CALCULAR A EXPOSIÇÃO DA POPULAÇÃO
A PARTÍCULAS ATMOSFÉRICAS

QUANTIFICAR A DOSE DE PARTÍCULAS
ATMOSFÉRICAS INALADAS

AVALIAR OS EFEITOS DAS PARTÍCULAS
NA SAÚDE HUMANA

IDENTIFICAR AÇÕES DE MELHORIA
DA QUALIDADE DO AR E SAÚDE

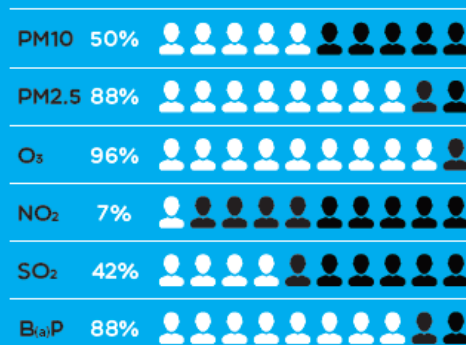
ENVOLVER A POPULAÇÃO
NA TOMADA DE AÇÃO

PARCEIROS



O projecto LIFE Index-Air conta com a colaboração de cinco instituições, sendo coordenado pelo IST.

Sabia que 90 % dos Europeus que vivem em zonas urbanas estão expostos a níveis de poluentes atmosféricos considerados prejudiciais para a saúde?



Percentagem de população exposta a concentrações superiores às diretrizes definidas pela Organização Mundial de Saúde

EM LISBOA...

- A ferramenta LIFE Index-Air vai ser desenvolvida e testada em Lisboa.
- O projeto irá avaliar a exposição a poluentes atmosféricos de crianças com idades compreendidas entre os 5 e os 9 anos.
- A avaliação da exposição a poluentes será efetuada em duas etapas:

Etapa 1: Estudo dos padrões de atividade-tempo das crianças através da aplicação de um questionário a 4000 crianças;

Etapa 2: Estudo da qualidade do ar dos microambientes que mais contribuem para a exposição das crianças através de medições de poluentes em casas, escolas e transportes.

QUESTIONÁRIO DOS PADRÕES
DE ACTIVIDADE-TEMPO
DAS CRIANÇAS

O questionário pode ser respondido
através do seguinte endereço:

<https://goo.gl/forms/1y2Wp4B5bWN7pl362>

Annex 3: Comparison between time activity pattern for a sample of 500 and 1189 children

	Week			Weekend		
	1189 children	500 children	Ratio	1189 children	500 children	Ratio
	%	%		%	%	
Indoor	89	88	1.0	87	87	1.0
Home	55	55	1.0	76	76	1.0
Classroom	27	27	1.0	0.70	0.69	1.0
School	26	26	1.0	0.17	0.11	1.5
Extra-curriculum activities	1.2	1.0	1.2	0.56	0.58	1.0
Physical activity	2.7	2.8	1.0	1.4	1.3	1.1
Gymnasium	1.7	1.9	0.9	0.74	0.66	1.1
Swimming-pool	1.0	0.91	1.1	0.65	0.59	1.1
Leisure	0.70	0.62	1.1	5.4	5.6	1.0
Shop/supermarket	0.20	0.21	1.0	1.7	1.7	1.0
Cinema/theatre	0.10	0.05	2.0	1.5	1.8	0.8
Restaurant/coffee	0.30	0.36	0.8	2.4	2.1	1.1
Transports	3.5	3.3	1.0	3.4	3.2	1.1
Outdoor	10	9.6	1.1	9.4	8.6	1.1
School	7.5	7.1	1.1	0.10	0.10	1.0
Physical activity	1.1	1.0	1.1	1.6	1.6	1.0
Street	1.1	1.2	0.9	3.1	3.1	1.0
Garden/park/esplanade	0.30	0.20	1.5	4.2	3.7	1.1
Beach	0.0	0.0	-	0.30	0.10	3.0
Other	0.50	0.53	0.9	2.6	2.7	1.0