

JOAQUIN

Decision Support Tool for air pollution reduction measures

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1st draft November 2014

2nd draft March 2015

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This report was drafted as a part of the Joaquin-project. This is an INTERREG IVB NWE project aiming to improve air quality in the Northwest European region.

Joaquin (Joint Air Quality Initiative) focusses on the air quality in Northwest Europe, the associated health effects and possibilities for improvement. The project comprises the measurement of some parameters showing a stronger correlation with health effects (ultrafine particles, particulate matter composition (metals, soot ...) than the currently measured PM₁₀ and PM_{2,5} parameters.

The project will also evaluate measures currently available to policy makers. Certain measures will even be piloted in the participating cities. These findings will be presented to stakeholders and policy makers, whilst providing them with a tool to start working on these measures (decision supporting tool).

Finally, this project will also spread information on these novel parameters and air quality in general to both experts and the general public, that will enable them to better assess the air quality in their own region.

Duration: 01/05/2010-30/11/2015

Partners:

- Belgium (4): Vlaamse Milieumaatschappij (VMM), Intergewestelijke Cel voor het Leefmilieu (IRCEL-CELINE), Vlaams Agentschap Zorg & Gezondheid (VAZG), Stad Antwerpen
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- United Kingdom (6): University of Brighton, University of Leicester, Leicester City Council, London airTEXT, Greater London Authority (GLA), Transport for London (TfL)

More information on the project can be found on www.joaquin.eu.



Acknowledgement

The Joaquin project partners are acknowledged for their contribution to the development of the decision support tool during the reviewing process and final construction of factsheets of air pollution reduction measures (list of affiliations). A special acknowledgement is there for the participants of the Reference Board Meeting in Antwerp and the Mid Term Conference in Leicester.

Abstract

Joaquin (Joint Air Quality Initiative, www.joaquin.eu) is a EU cooperation project supported by the INTERREG IVB North West Europe programme (www.nweurope.eu). The aim of the project is to support health-oriented air quality policies in Europe. This is done by providing policy makers with the necessary evidence on the current local and/or regional situation (e.g. measurements of emerging health relevant parameters), providing policy makers with easy to access evidence of best-practices regarding mitigation measures and motivating policy makers to adapt and strengthen their current air quality policies.

A decision support tool for air pollution reduction measures for urban environments was developed as part of the Joaquin project. The decision support tool provides policy makers with information on best practices by sharing information in a web tool (www.joaquin.eu). The information on potential measures is presented in factsheets.

The web-tool offers different methods to make selection of potential measures, either by ranking all measures available in the toolbox or by search through categories or keywords. The tool lists the measures meeting the search-criteria according to their Joaquin-score, which is a combination of the potential to improve air quality and the strength of the evidence supporting that. The factsheets, in essence condensed reviews by a board of international experienced experts in the JOAQUIN project-team, are designed as one page leaflets, providing a brief description of the measure, the JOAQUIN view in a few lines and the score of the measure by a green, yellow or red stamp. For each leaflet, more extensive information on examples, (potential or elsewhere established) air quality effects and potential co-benefits is available through a click-menu. The full documents, including references and suggested reads are also downloadable in the tool and available in this report (appendix 5).

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1. Introduction

A decision support tool has been developed during the review of air pollution reduction measures for urban environments as part of Joaquin project action 5. Factsheets of the measures are the final result of the reviewing process and are the fundamental part of the decision support tool. They can be found in the appendix of this document. This document reports about the deliverables of action 5 through the description of the reviewing process (chapter 2) and the decision support tool with the factsheets (chapter 3) and by the information in the appendices. The Joaquin project and specifically action 5 are introduced in the next section, followed by the related deliverables.

1.1 Joaquin action 5.

Joaquin (Joint Air Quality Initiative, www.joaquin.eu) is a EU cooperation project supported by the INTERREG IVB North West Europe programme (www.nweurope.eu). The aim of the project is to support health-oriented air quality policies in Europe. To achieve this, the project is constructed around three different topics; capacity building, measures and dissemination and communication. The first project part, capacity building (what does this mean for us), will provide policy makers with the necessary evidence on the current local and/or regional situation (e.g. measurements of emerging health relevant parameters). The second part, measures (what can we do about it), provide them with best-practice measures that can be taken and the third part to motivate them to adapt and strengthen their current air quality policies.

This document reports about Joaquin action 5 which is part of the second topic, measures. This action is all about an **assessment to identify and rank measures mitigating traffic emissions related health impacts** in urban NWE areas. With this action we aim to assist local authorities in improving their urban air quality by identifying and ranking AQ improvement measures, considering also their health relevance. This action will assess the attainability, acceptance and success of reduction measures, via a transnational exchange of knowledge and experiences with their implementation.

The assessment is proposed because the negative impacts of air pollution on health are particularly pertinent in the densely populated urban areas of NWE, where traffic constitutes the most major and important source of pollution. In an attempt to improve this problem, authorities design & implement a multitude of local initiatives and mitigation measures. Approximately 100 M€ is invested in NWE each year to improve AQ. However, lack of knowledge and experience has led to isolated and often expensive solutions with varying and uncertain outcomes. Furthermore, these strategies have not yet been evaluated from a health endpoint perspective.

To achieve this goal information and findings regarding traffic measures will be collated from institutes and city administrations involved in Joaquin, along with results obtained from earlier initiatives such as INTERREG IV-C, CiteAir and PACT. Valuable information is often only available in documents written for local authorities which are therefore in the local language (not English), with very limited distribution. We will therefore translate and utilise all appropriate documents. Without repeating earlier analysis, an objective verification will be undertaken to guarantee that the information used was not poorly validated or speculative in data interpretation.

This work will result in a ranking (i.e. decision matrix) taking into account: implementation issues (costs, support of the local population), findings from measured or modelled data indicating

improvement of urban AQ, and the expected effects on health. An advisory scheme will be written including all aspects that need to be considered in the selection and implementation of measures.

1.2 Deliverables of action 5.

A numbered list of the Joaquin action 5 deliverables is given below. The realization of each deliverable is given by an alphabetic list of realizations and related cross-reference.

- 1) An increased knowledge for partnership and observers regarding the health relevance of reduction measures.
 - a. Coordination Group Meetings (section 2.2).
 - b. Reference Board Meeting Antwerp (section 2.3, appendix 4).
 - c. Mid-Term Conference Leicester (section 2.4, appendix 4).
- 2) An integrated and updated review on air pollution reduction measures taken in the NWE-region resulting in a report including a decision matrix ranking the best air pollution reduction measures available for urban environments. The ranking will take into account both the ability to reduce pollution concentration and the impact on health.
 - a. This document!
 - b. A disclaimer and methodology (appendix 1 and 2).
 - c. The review process (chapter 2).
 - d. The decision support tool (section 3.2).
 - e. The factsheets (section 3.3 and appendix 5).
 - f. The joaquin view and score (section 3.4).
- 3) Advices on how local authorities can improve their air quality.
 - a. A manual for the web-tool (section 3.2).
 - b. A manual for local policy on air pollution reduction measures (appendix 3).
- 4) A web-tool to guide air quality experts and policy makers through the decision matrix, to enable them to identify the highest ranked measures for their particular situation. In addition this web-tool will encourage networking capabilities for end-users of the services, to provide feedback and comments and/or swap advice on the implementation of measures and the decision matrix.
 - a. The web-based version of the decision support tool, www.joaquin.eu.
 - b. Feedback and comment options (web-based version).
 - c. Text for the landing page (section 3.2).
- 5) Input into the website for the general public which is clear, self-explaining and informative for all non-experts.
 - a. Summary of this document for the public website, www.cleanerairbetterhealth.eu
 - b. Factsheets (appendix 5).
- 6) A presentation of the results during the Midterm and End Event of the Joaquin project, targeted at policy makers and air quality specialists.
 - a. Presentation of the Mid-term conference Leicester (appendix 4).
 - b. Final conference Amsterdam (June 2015).

2. Reviewing Measures

The review of air pollution reduction measures for urban environments with the final construction of factsheets and the decision support tool has been a process that started around summer 2012 and continued until December 2014 and required three stages:

1. Selection of literature (2012).
2. Selection of a dissemination method based on the first reviews (2012-2013).
3. The construction of factsheets (2013-2014).

For all three stages the exchange of knowledge and experience during the regular Coordination Group Meetings of the project proved to be very important. These Coordination Group Meetings (CGM) were used to have discussion amongst all Joaquin project partners on the progress and how to continue with the reviewing process. During these meetings new timelines with the workload for each partner were agreed upon. The lead in this process was taken by the Dutch project partners, ECN and GGD, who had frequent bilateral discussions. Intermediate versions of the decision support tool and factsheets were presented at the first reference board meeting (section 2.2.1) and during the Mid-term Conference (section 2.3.1).

2.1 Selection of Literature

Selection of literature was discussed during the London and Utrecht CGM meetings in respectively June and October 2012. Logically, the selection of literature continued during all stages of the review process (up to mid-2014). All project partners were asked for their input of literature specifically concerning their local experience with implementation of air pollution reduction measures. Dropbox has been used as information platform among the project partners.

As a result an extensive literature search was undertaken for both academic & non-academic literature published. Academic literature was restricted to peer-reviewed journals. Non-academic (grey) literature included implementation reports on measures by local councils, governmental agency's (e.g. highways, health protection), and county or regional level reports. Grey literature may not have been peer reviewed and was therefore explicitly scrutinized for robustness by the Joaquin panel of experts. Papers were obtained from searches on google, electronic databases and from personal contacts within e.g. local councils. In order to include a paper within the reviewing process by the JOAQUIN project partners to assemble the factsheets, each paper had to meet the following criteria. It had to be published in English, French or Dutch (Flemish).

Apart from literature sources, organised information available on air pollution dedicated websites and reports of projects and organisations were considered.

Websites considered included:

- 1) www.lowemissionzones.eu
- 2) www.sootfreecities.eu
- 3) www.integrated-assessment.eu
- 4) www.appraisal-fp7.eu
- 5) www.sefira-project.eu
- 6) www.LowEmissionHub.org

- 7) www.eltis.org
- 8) <https://luft.umweltbundesamt.at/measures>

Project results considered included:

- 1) CITEAIR I (2004-2007, which developed and implemented air quality indices on the EU level), *INTERREG IIIC*.
- 2) CITEAIR II (2008-2011, implemented the website www.airqualitynow.eu and the Common Air Quality Index (CAQI)), *INTERREG IVC*
- 3) PRONET (Pollution Reduction Options NETWORK, 2007-2009, *EU-FP6 SSP*.
- 4) SOLVE (Information on air pollution reduction measures, www.solve-maatregelen.nl (Dutch). *CROW*.

Reports of Organisations considered included:

- 1) WHO; REVIHAAP (Review of evidence on health aspects of air pollution)
- 2) WHO; Health Effects of transport-related air pollution, 2005.

2.2 From Decision Matrix to Decision Support Tool

During the Leicester and Brighton CGM meetings (March and June 2013) the dissemination method for the reviews of measures was discussed. The final proposed dissemination method, a decision support tool with factsheets was presented during the first reference board meeting in Antwerp (September 2013). Valuable feed-back from the Antwerp meeting has been used in the construction of the decision support tool and factsheet described in section **Fout! Verwijzingsbron niet gevonden..**

Initially a decision matrix was proposed as final product of action5 and during the Utrecht CGM (October 2012) the first set-up was made and the issues needed were discussed. Based on the discussion an excel demo version of a decision matrix was presented to the project partners during the Leicester CGM. The proposed decision matrix offered the policy makers the best air pollution reduction measures available based on three levels on input:

1. Selection of one, a category or all measures.
2. Selection of three groups of topics to create a decision model
 - a. Primary impacts (Air Quality and Health)
 - b. Secondary impacts (Noise, Climate, Safety, Accessibility)
 - c. Implementation issues (Project lead time, acceptance, cost benefit analysis).
3. User defined weights for these three groups.

The result of the user input would have been a ranking list of measures. However, to create such a decision matrix a uniform database is needed which should be filled by the review of the literature found (section 0). Therefore the challenges are setting clear evaluation procedures for the collected literature and criteria for ranking measures and creating the decision matrix.

During the Leicester CGM the partners agreed to divide the material collected (around 80 articles/reports) for reviewing amongst them (March 2013). It was proposed to build a database based on these reviews to create the first decision matrix just before the CGM in Brighton (June 2013). In April 2013 a pre-selection of the literature and an exemplary evaluation form was sent as guidance for the review as it turned out that creating a universal form to cover the range of articles and reports is practically impossible. Parts of the evaluations were sent back before the CGM in Brighton (June 2013). During this CGM the reviews and the problems encountered were discussed. It turned out that article and report reviews do not easily allow incorporation in a decision matrix. Instead it was agreed that grouping the literature along selected policy measures and summarize the information available into factsheets was the best way forward. As such a factsheet is the final information product instead of a decision matrix and the guidance tool to find the desired factsheet is a decision support tool.

During summer 2013 the first factsheet was made and a decision support tool was designed to present at the first reference board meeting in Antwerp (September 2013).

2.2.1 Reference Board Meeting Antwerp.

The first reference board meeting for the Joaquin project was organised in the city of Antwerp on 19th September 2013. This reference board meeting, with a focus on the second work package (measures), was addressing academics, researchers, policy experts and organizations with an interest in air quality to discuss some of the goals and actions put forward in the Joaquin project. The Invitation with the agenda and list of guest speakers is given in appendix 4.1.

In a first part of the meeting a brief account of the project's accomplishments so far was given, followed by a presentation of our decision support tool and communicating air quality. This tool aims to assist policy makers in navigating all available air quality measures and it is currently based on 80 reports on these measures. The central topic during the presentation and ensuing discussion was the manner in which such a tool would be used by our target group (policy makers). This led to the conclusion that additional information such as cost, co-benefits and implementation issues are considered as highly valuable by our target group. The Joaquin target group will use this conclusion and the other input gathered throughout the meeting to tailor the end product to the needs of our target group, ensuring it to be a highly relevant tool.

The second part of the meeting consisted of different workshops related to air quality measures and the accompanying decision making process, addressing the following topics: low emission zones, filtration, greening the cities, air quality and public transport and sports in a city.

2.3 Construction of Factsheets

During the CGM in Amsterdam (October 2013) just after the reference board meeting the status of the reviews, the feedback on the first factsheet and preliminary design of the decision support tool was discussed. It was agreed to start working with a system of factsheets with digested information

and an expert Joaquin opinion for each measure. A working group was formed to work on the first 11 factsheets to be discussed during the CGM in Bruges (February 2014). The measures included congestion charging, environmental zone, speed limit reduction, greening the city, innovative technologies, traffic signal coordination, traffic reallocation, Urban planning, Car sharing, Electric cars and active transport. The literature collected was searched on these measures by ECN and GGD and additional material was gathered to cover the measures selected. The work group was informed on the selected literature by December 2013 and the first factsheet prepared and presented at the reference board meeting served as an example.

During the CGM in Bruges 4 draft versions of the factsheets were presented and discussed and some reassignment was needed. Some factsheet formatting suggestions were done, but more importantly the workgroup discussed on the Joaquin view and score. It was agreed to work to first final drafts beginning of April followed by a reviewing by ECN and GGD. Drafts were revised due to comments and interpretation differences and first factsheets were ready during the Mid-term Conference in Leicester (section 2.3.1). A final round of factsheet assignments and reviews took place up to the CGM in Haarlem (October 2014). Finally XX factsheets were made each assessed by two project partners. A third assessment was executed by rereading all factsheets for language proofing by Greater London Authority and complemented with their experience where possible.

2.3.1 Mid-term conference Leicester.

The Joaquin mid-term conference, 'Tackling Tomorrow's Air Pollution Today - a solution oriented approach, organised by the University of Leicester (May 2014), offered a unique opportunity to discover and discuss Joaquin's work to date with stakeholders, scientists and local, regional or national policy makers. At the same time, it offered the possibility to contribute to the development of the next generation of air quality policies.

The invitation, agenda and a summary of what has been discussed throughout the conference can be found on appendix 4.2. The decision support tool as described in section 3.2 was presented, together with the first factsheets.

3. Decision Support Tool and Factsheets

3.1 Introduction

During summer 2013 the first factsheet was made and a decision support tool was designed to present at the first reference board meeting in Antwerp (section 2.2.1). The final design of the decision support tool (section 3.2) and factsheets (section 3.3) was presented at the Mid-term conference in Leicester (section 2.3.1). . The factsheets are made accessible for both policy makers and the public through the web-based decision support tool at www.joaquin.eu. The downloadable disclaimer and the methodology for the decision support tool and factsheets are found in respectively appendix 1 and 2. A manual for local policy on air pollution reduction measures will be accessible as well (appendix 3).

3.2 Design Decision Support Tool

The decision support tool will be web-based and offers the user a selection, either to rank all measures included or to search for a category of measures or keyword (figure 1). Figure 2 gives a possible ranking of the measures found after selecting all measures. The ranking uses the Joaquin score (section 3.4), which is a good / average / bad score of the measure.

Figure 1: Main selection of the support tool



Figure 2: Possible ranking of measures

RANKING OF MEASURES	
NAME ▼ ▲	JOAQUIN SCORE ▼ ▲
Active transport	●
Car sharing	●
Clean vehicles	●
Electric vehicles	●
Engine idling reduction	●
Filtration	●
Fleet renewal	●
Fuel taxation	●
Low emission zones	●
Modal shift	●
Speed limits	●
Street cleaning	●
Traffic charging zone	●
Traffic reallocation	?
Traffic signal coordination	●
Urban planning	?
Vegetation	●



3.3 Design Factsheet

The factsheets are designed as one page leaflets, providing a description of the measure together with the Joaquin project view and the score of the measure by a green, yellow or red stamp. They are in fact longer documents with a user selection for opening the second level of information. This second level covers examples of locations where the measure is implemented, the modelled or measured effects of the measure, co-benefits, keywords, related factsheets and the references which can serve as a third level of information. Each factsheet was independently assessed by at least three project partners (section 2.3). Figure 3 presents the main page of a factsheet, whereas figure 4 presents a factsheet with opening up further information (examples of the measure).

3.4 Joaquin View and Score.

The Joaquin view is the expert opinion of the Joaquin partners based on professional experience and the findings presented in the factsheet. A simple classification system (good/moderate/low) is used for guidance to present the potential of a policy measure and the reliability of the data reviewed up to the date of publication. The final score of the measure makes use of the same grading with the potential of the measure and reliability of the data equally weighted. A combination of both good and good-medium is graded as good and a combination of both low and medium-low as low. Every other combination has a medium grading.

Figure 3: Factsheet main page



JOAQUIN factsheet



MEASURE

Congestion Charging Scheme (AKA Traffic Charging, Road Use Charging)

DESCRIPTION

A congestion charging scheme (CCS) is a payment for the right to drive into a city center. The desired result is to reduce the traffic intensity and thus the pollution loading in a specific area, *i.e.*, the city center. Driver pays when entering the zone. Tariffs may depend on vehicle classification (*e.g.*, heavy-duty vehicle, light-duty vehicle, electric, diesel, vehicle age, etc.), time of the day (*e.g.*, maximum during rush hours, no charge in weekend), duration of travel and distance travelled.

THE JOAQUIN VIEW

Clear evidence of reduction in traffic, congestion and emissions. Due to the complex nature of air pollution, positive effects on traffic-related air pollution are possible, but the effect size depends on local traffic situation. As it is typically applied in a densely populated area, exposure reduction is expected, but the impact on surrounding areas, *e.g.*, pollution redistribution, has to be considered. Possible drawbacks are societal skepticism, social injustice and implementation costs, but since very usable systems have now been developed, the costs of implementation can be reduced considerably. In general, as supported by the examples, both the potential of the measure and the reliability of the data are considered good.

[EXAMPLES](#) | [EFFECTS](#) | [CO-BENEFITS](#) | [SUGGESTED READ](#) | [KEYWORDS](#)
[RELATED FACTSHEETS](#) | [REFERENCES](#)

Figure 4: Factsheet opening additional information: example, page 1

JOAQUIN factsheet



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[EXAMPLES](#) | [EFFECTS](#) | [CO-BENEFITS](#) | [SUGGESTED READ](#) | [KEYWORDS](#)
[RELATED FACTSHEETS](#) | [REFERENCES](#)

London, UK: A congestion charging zone was introduced in 2003 which covers 22 km² of central London with cameras used for enforcement. Between 2007 and 2011 a larger zone was in operation. The charge was initially set at £5 and has since risen to £11.50 in 2014, with a £1 discount if vehicles register to pay automatically.

In the first period after implementation congestion fell by around 20-30 percent. Traffic entering the zone fell by 18 percent and traffic circulating the zone fell by 15 percent. However, after a few years the congestion situation has returned almost to pre-charging levels, although the shift in vehicle-type (from private cars to taxi, bus, tube, rail and bicycle) has remained. This is largely due to a reduction in available road space for private cars, with space re-allocated to pedestrians, cyclists and buses. Traffic reduction remains broadly similar to when the scheme was introduced and reports indicate congestion would be significantly worse without the charge. There was a small increase in traffic on the boundary road as a result of the charge, but no evidence of an increase in traffic outside the zone as a result.

Currently vehicles meeting Euro 5 standards and emitting less than 75 g CO₂/km are eligible for a 100 percent discount, known as the Ultra Low Emission Discount. Currently only plug in hybrid and electric vehicles can meet this standard. This discount replaces the earlier greener vehicle discount which applied to all vehicles emitting less than 100g CO₂/km and was inadvertently encouraging more diesel vehicle into the centre. As of June 2014 2000 vehicles had applied for the discount.

According to Santos (2005), congestion and travel times have decreased, average speeds have



Appendix 1: Disclaimer decision support tool and factsheets.

A1.1 Introduction

This disclaimer governs the use of the decision support tool and the information about best-practice health-oriented air quality measures summarized in factsheets. The decision support tool is a guidance tool to these factsheets. Both products are deliverables of the JOAQUIN (Joint Air Quality Initiative) project and freely downloadable from the JOAQUIN website (www.joaquin.eu). The JOAQUIN project is an EU cooperation project funded by the INTERREG IVB North West Europe programme (www.nweurope.eu).

A1.2 Guidance only.

The factsheets are the result of a joint review process of the JOAQUIN project partners (chapter 2). The methodology of this process is described in a complementary document (appendix 2), downloadable at the JOAQUIN website (www.joaquin.eu). A factsheet provides policy makers with condensed generalized information and references for best-practice health-oriented air quality measures. A JOAQUIN view and JOAQUIN score for each measure is provided as guidance.

The factsheets are a starting point for policymakers and have been compiled from current research by experts working on the Joaquin project; they do not however, replace a local assessment of your situation.

This is for guidance only and we the JOAQUIN project partners cannot be held responsible for any unforeseen consequences resulting from the use of the decision support tool and factsheets. We cannot guarantee any particular outcome or result.

The decision support tool and the factsheets only reflect the view of the JOAQUIN project partners, and ITERREG IVB NEW cannot be held responsible for any use which may be made of the information.

Appendix 2: Methodology decision support tool and factsheets.

A2.1 Introduction

This document governs the methodology followed to generate the decision support tool and factsheets. The decision support tool is a guidance tool to the factsheets. A factsheet provides policy makers with condensed generalized information about best-practise health-oriented air quality measures and references for further consideration. The factsheets are the result of a joint reviewing process of the JOAQUIN project partners. The JOAQUIN view and score for the measure is given as guidance only (see disclaimer appendix 1). Both products are deliverables of the JOAQUIN (Joint Air Quality Initiative) project and factsheets are freely downloadable from the JOAQUIN website (www.joaquin.eu). The JOAQUIN project is an EU cooperation project funded by the INTERREG IVB North West Europe programme (www.nweurope.eu).

A2.2 Selection of Literature and other sources

An extensive literature search was undertaken for both academic & non-academic literature published. Academic literature was restricted to peer-reviewed journals. Non-academic (grey) literature included implementation reports on measures by local councils, governmental agency's (e.g. highways, health protection), and county or regional level reports. Grey literature may not have been peer reviewed and was therefore explicitly scrutinized for robustness by the Joaquin panel of experts. Further sources of information for the reader can be found amongst others on the following webpages; www.lowemissionzones.eu, www.sootfreecities.eu, www.integrated-assessment.eu, www.appraisal-fp7.eu, www.sefira-project.eu, www.LowEmissionHub.org, www.eltis.org, <https://luft.umweltbundesamt.at/measures>.

A2.3 Selection of Measures

The selected literature was divided into subject groups; some of the subject groups were later separated, merged or rejected based on emerging experience. For the following 22 subjects factsheets were produced; 1 Congestion charging scheme, 2 Fuel taxation, 3 Clean vehicle incentives, 4 Clean vehicles, 5 Electric vehicles, 6 Fleet renewal, 7 Environmental zone, 8 Traffic restriction, 9 Speed limit reduction, 10 New technologies (e.g. TiO₂ coatings), 11 Vegetation, 12 Traffic signal coordination, 13 Traffic reallocation, 14 Parking, 15 Car-pooling, 16 Car sharing, 17 Modal shift, 18 Active transport, 19 Engine Idling, 20 Street Cleaning, 21 Infrastructure and 22 Urban planning.

A2.4 Factsheet

The factsheets are designed as one page leaflets, providing a description of the measure, the Joaquin project view and the score of the measure by a green, yellow or red stamp. They are in fact longer documents with a user selection for opening additional information. Additional information are examples of implementation, modelled or measured effects, co-benefits and references. Each factsheet was independently assessed by three project partners. The Joaquin view and scoring are described in section A2.5.

A2.5 Joaquin view and score

The Joaquin view is the expert opinion of the Joaquin partners based on professional experience and the findings presented in the factsheet. A simple classification system (good/average/low) is used for guidance to present the potential of a policy measure and the reliability of the data reviewed up to the date of publication. The final score of the measure makes use of a similar grading with the potential of the measure and reliability of the data equally weighted. A combination of both good and good-medium is graded as good and a combination of both low and medium-low as low. Every other combination has a medium grading. As such all three final grades are the result of three combinations each.

Appendix 3: Inspiration for healthy local air quality policies

The JOAQUIN Decision Support Tool is developed to support decision makers and their assistants, such as civil servants, in choosing the best fit measures to improve their own local air quality traffic policies. However, picking the best fit measure does not necessarily mean it will be implemented straight away. In this **document** the authors, from their own experience, share with local decision makers and their assistants' tips and tricks contributing to improved air quality policies. Needless to say this **document** is not conclusive and it is always necessary to adapt your approach to the local situation.

Step 1: Know your local situation

Before you get started, make sure you get to know your local situation:

- ❖ What is the local air quality?
Gather information from your (national/regional/local) air quality monitoring network and/or air quality modellers for detailed information on the local pollution levels. Talk to the people in the work fields and ask for information on:
 - air quality as a whole, and the different components (at least PM10, PM2.5, soot (Black Carbon or EC), NO₂, O₃)
 - Spatial variation: where are the 'dirty spots' (and because of what sources)
 - Temporal variation: what are the 'dirty periods' (seasonal, day of the week, hour of the day)

- ❖ What is the most dominant source of air pollution?
And are there specific 'polluters' within that source type?
For instance, older and heavy duty diesel vehicles emit much more particles and soot than the majority of vehicles on the road. A few percent of road traffic may be responsible for the majority of emissions.

- ❖ Who has valuable information? Consult these people and/or co-work with them;
They may also be in other fields, such as:
 - Traffic planning, infrastructure, (public) transport, spatial planning, (urban) layout, environment, energy, noise
 - Public health, environmental health, hospitals/GP's
 - Non-Governmental Organisations (such as environmentalists, cycling initiatives, patient organisations), private sector, business (such as car sharing, cargo initiatives)

Step 2: Formulate your aim and ambition

What drives your need for improved air quality policies? Is it legislation or are your ambitions in improving living environment and health?

- ❖ Legislation: Meet EU (or national) Air Quality Guidelines

- ❖ Create a healthier living environment; in addition to meeting EU Guidelines by:
 - Meeting WHO Guidelines (which are much stricter)
 - and/or reducing the public health impact of poor air quality by separating sources from (vulnerable) public by means of spatial planning, infrastructure and other policies

Step 3: Pick a (set of) measure(s)

Use the Decision Support Tool for inspiration.

Step 4: Make sure your information and ambition match

Define the air quality effectiveness of your proposed measure(s). Depending on your aim and ambition this may be a rough indication, or a component-specific and precise (model)estimation may be necessary.

- ❖ When your ambition is to meet EU Legislation;
 - you may use small scale spatial modelling (such as dispersion models) for local estimations
 - and focus on legislated components: PM₁₀, PM_{2.5}, NO₂, O₃
- ❖ When your ambition is to create a healthier living environment, your desired outcome may be;
 - air quality improvement, also for other components that are health relevant but not legally important, such as soot (Black Carbon or EC) and ultrafine particles (UFP)
 - a combination of population (size) and air quality improvement: a small change for a lot of people maybe resulting in larger health benefits than a large change for a small number of people
 - taking into account characteristics of the population, such as presence of vulnerable people (specifically: children, elderly, and people with a respiratory- or heart-condition or diabetes)
- ❖ Get the right specialists involved. For inspiration on organisations, have a look at the JOAQUIN partnership

Step 5: Make sure your ambitions and proposed measures have support

Measures are often influencing habits or investments by society, businesses, and/or governments. You may therefore face opposition when you propose (a set of) measures.

- ❖ Political support is critical
- ❖ Public support is needed, at least from the political background of the policy maker in place. Public support is therefore a necessity for political support.

Often support is influenced by;

- Feelings of urgency: is the politician/policy maker convinced about the necessity to improve air quality?
- Confidence in the measure: is the proposed measure leading to the desired results. Use information gathered elsewhere (see Decision Support Tool factsheets for inspiration) and (model) prognoses for your local situation
- Cost-effectiveness: is the result of the measure in agreement with the investments needed? Consider social and economic equity issues, and the politics involved, when the measure requires public investments.
For public support, take into account that measures (strongly) influencing daily life are perceived as costly (even when not costing actual money), experiments showed that that this effect may reduce over time.

Appendix 4: knowledge for partnership and observers

A4.1 First Reference Board Meeting

Invitation Reference Board Meeting Antwerp: Air quality measures

On **19 September 2013** the first Reference Board meeting for the Joaquin-project will be organized in the city of Antwerp.

This Reference Board meeting is addressing academics, researchers, policy experts and organizations with an interest in **air quality** to discuss some of the goals and actions put forward in the Joaquin project. Focus of this first reference board meeting will be on the second work package: **measures**. This work package aims to explore, implement and evaluate different measures to decrease public exposure to air pollution.

Confirmed guest speakers:

Dr. Peter Vos, Flemish Institute for Technological Research (VITO)

Dr. Luc Int Panis, Flemish Institute for Technological Research (VITO)

Dr. Marianne Stranger, Flemish Institute for Technological Research (VITO)

Dr. Isaak Yperman, Transport & Mobility Leuven (TML)

Prof. dr. Roeland Samson, University of Antwerp (UA)

Prof. dr. Wilfried De Backer, University of Antwerp (UA)

Elliot Treharne, Greater London Authority***

Alex Letteboer, Managing director & Berit Piegras, Architect – Project manager ‘Clean Air Cities’, Atelier Pro

Prof. dr. A.R. MacKenzie, University of Birmingham

Finn Coyle, Transport for London

Dr. Marieke Dijkema, Municipal Health Service Amsterdam

Dr. Maciek Strak, Municipal Health Service Amsterdam

David Gelauff, Program Bureau Air Quality Amsterdam

Nicholas Hodges, Municipality of Leicester



JOAQUIN



A4.2 Mid-Term Conference Leicester



University of
Leicester JOAQUIN

Tackling Tomorrow's Air Pollution Today - a solution oriented approach - (Leicester, 21-22 May 2014)

Joaquin (Joint Air Quality Initiative) is an EU cooperation project supported by the **INTERREG IVB** Northwest-Europe programme. The aim of the project is to support **health-oriented air quality policies** in Europe. To achieve this, the project will provide policy makers with the necessary evidence on the current local and/or regional situation (e.g. measurements of emerging health relevant parameters), provide them with best-practice measures that can be taken and motivate them to adapt and strengthen their current air quality policies.

This conference, organised by the University of Leicester, features as the mid-way point of the project and its Belgian, British, Dutch and French partners. At this moment all project actions are past the initial stages and steadily progressing, resulting in the first deliverables and results becoming available. This offers a **unique opportunity to discover and discuss** Joaquin's work to date with you as a stakeholder, scientist or local, regional or national policy maker. At the same time, it offers the possibility to contribute to the development of the next generation of air quality policies. The programme of the conference will include contributions of EU level professionals.

Agenda Wednesday 21 May

08:30 - 09:30: Registration

09:30 - 09:55: Introduction

09:55 - 10:15: Why should we care about air pollution?

10:15 - 10:35: Attitudes of Europeans towards air quality - Eurobarometer

10:35 - 11:00: New policy package to clean up Europe's air

11:00 - 11:30: *Coffee Break*

Theme 1 : The definition of tomorrow's air pollution

11:30 - 11:55: Current state AQ, challenges for the coming years

11:55 - 12:15: What is contributing to your air pollution?

12:15 - 12:55: How to monitor health relevant indicators?

12:55 - 13:00: Conclusions

13:00 - 14:30: *Lunch break*

Theme 2: Low Emissions Urban Development

14:30 - 15:00: Organising our streets for air pollution

15:00 - 15:50: Symposium 1: Low-Emission-Zones:
Berlin - London - Amsterdam - Antwerp

15:50 - 16:10: Mobility & policy making in an urban context

Theme 2: Low Emissions Urban Development

14:30 - 15:00: Organising our streets for air pollution

15:00 - 15:50: Symposium 1: Low-Emission-Zones:
Berlin - London - Amsterdam - Antwerp

15:50 - 16:10: Mobility & policy making in an urban context

16:10 - 16:40: *Coffee Break*

Theme 3: Solutions to decrease exposure to air pollution

16:40 - 17:10: Solutions that mitigate or adapt?

17:10 - 17:50: Symposium 2: Increasing the quality of your traffic Intelligent traffic
management - Last-Mile-logistics - Clean Vehicles

17:50 - 18:00: Closing words

Agenda Thursday 22 May

09:00 - 09:10: Air Quality, an issue for EU cohesion

09:10 - 09:20: Joint Air Quality Initiative

09:20 - 09:50: UK Policy

Theme 4: Health aspects & solutions to decrease exposure to air pollution

09:50 - 10:20: Air Quality & Health

10:20 - 10:40: Review of evidence on health aspects of air pollution (REVIHAAP)

10:40 - 11:10: Filtration of air pollution?

11:10 - 11:40: *Coffee Break*

Theme 5: Public empowerment & Policy Makers engagement

11:40 - 12:00: Public Empowerment

12:00 - 12:40: What measures to take: preparation of a tool to support policy makers

12:40 - 12:50: Conclusions

12:50 - 13:00: Final closing words

13:00 - 14:00: Closing lunch

Accommodation & registration

Please book your room directly with the Conference Centre. We have reserved a block of rooms which will be held until 5th May 2014. The Bed and Breakfast

A summary of what has been discussed throughout the conference can be found below.

1) Future challenges

Air pollution is a global problem as it impacts human health, contributes to climate change and damages ecosystems. Through European directives, the member states have been able to reduce emissions of several air pollutants. Despite these reductions however, the percentage of Europeans exposed to PM levels above EU limit values remained stable the past ten years. One of the future challenges we are facing is the growing world population linked to already rising health costs associated with air quality. More than 3 billion additional people are expected globally by 2100, this will not only lead to a drain on natural resources but also raise anthropogenic emissions of air pollution. Currently health costs associated with air quality in the UK are around 15 billion pounds, which is 50% more than costs due to obesity. A recent study into the attitudes of Europeans towards air quality by TNS Opinion called the Euro barometer, revealed that about 17% of the population in Europe already claims to suffer from respiratory problems. Finally, new challenges might emerge in the future by new chemistry in our emissions.

2) Future air pollution

It has been shown that secondary aerosols are transported over long distances, but regional sources also contribute to the concentration of these aerosols. During winter episodes there is a great contribution of emissions from domestic heating to particulate matter concentrations. This is mainly caused by wood burning, which is becoming a more important factor. It is therefore of prime importance to be able to distinguish between domestic heating and other sources such as traffic, industry etc. This can be done through source apportionment with specific tracers. New metrics will also improve our understanding of the most harmful fractions of air pollution.

One of these new metrics (ultrafine particles) has been studied by the Joaquin and UFIREG projects. Through routine measurements of this pollutant it has become clear that their concentration in urban areas depends strongly on meteorological conditions, the source and the cityscape. Extensive quality assurance is currently essential to perform routine measurements of ultrafine particles. There are also indications of differences in short-term health effects caused by ultrafine particles and particulate matter. Further research is absolutely required to fully understand the role of ultrafine particles in air pollution and its health effects.

The European Union's Seventh Framework Programme funded the ESCAPE project. The Escape study ran from June 2008 to June 2012 and looked at the health effects associated with long term exposure to current air pollution. It was shown that there was a greater relative risk for numerous symptoms such as lower birth weight, respiratory infections and lung cancer. The results however did not single out traffic as the main source, but they do argue for lower limit values in Europe.

It is clear that solutions are needed to tackle these problems and help us in attaining lower levels of air pollution. Many of these solutions have been trialled over recent years and can provide us with a solid basis now to start mitigating future air pollution from now on.

3) Urban solutions

One of the solutions to high air pollution levels in urban areas that is often looked at is the introduction of a low emission zone. The city of Amsterdam introduced such an LEZ for heavy duty vehicles in 2009, the effects have been reported recently in Atmospheric Environment. The LEZ led to

a decrease in the traffic contribution to the air pollution concentrations, stricter LEZ implementation periods showed a further improvement in local air quality. This demonstrates the potential benefits of an LEZ through long term monitoring.

The city of Antwerp presented their work on a feasibility study for this LEZ. The most explicit reduction is expected for elemental carbon with a 15 to 35% reduction in the concentrations. The introduction of an LEZ in Antwerp also promises a great reduction in the number of inhabitants exposed to the highest elemental carbon concentrations.

4) Emission solutions

Another solution lies in directly reducing the emissions through cleaner vehicles. Sustainable transportation is a very significant challenge, both technology and consumer community are starting to respond now. This can be seen in the growing ownership of electric vehicles in the UK and the rising number of charging points available. This provides us with the opportunity to lead the way in reducing emissions directly through electric vehicles, but also through gas vehicles.

A different strategy focusses on last mile logistics, as many organisations do not focus on the 'last mile' deliveries to homes or smaller shops. Incomplete deliveries generate additional CO₂ and air pollution and increase congestion. This problem can be overcome through centralised consolidation centres, allowing for more efficient delivery planning.

5) Exposure solutions

Yet another range of solutions can be found in filtration systems to reduce our exposure to air pollution. This can be done in houses and schools, but also in vehicles. As we see elevated air pollution levels near high traffic roads, this also implies an elevated exposure of the passengers inside vehicles. Research has now shown that particle number concentration inside a vehicle are roughly 50% of the concentration on the road. Recirculating the air inside the vehicle led to a significant decrease and decoupling of the outside concentrations. No clear difference was observed for gaseous pollutants. Therefore one of the most effective solutions remains cutting back on our driving time, implying a behavioural change.

6) Public engagement

A powerful tool to encourage behavioural change can be found in communication on air quality. During the conference it was demonstrated that there is a clear need for improved communication on air quality. It was shown that making people aware of the issue is only the first step. By demonstrating the relevance of air quality to their life and getting them involved, we will be able to motivate people to openly support our cause. In a final stage these motivated individuals will become the actual promoters of the cause. Several best practices were presented such as turning air quality monitoring campaigns into communication opportunities.

Implementing these solutions throughout Europe, adapted to the local situation will allow us to start mitigating our future air pollution today.

The Joaquin partnership would like to thank once more everyone who contributed to making this conference a success.

Appendix 5: FACTSHEETS