

LA NOUVELLE NORME ISO 12913

et ses implications pour l'évaluation
subjective et objective des Paysages
Sonores

Nicolas Chouard

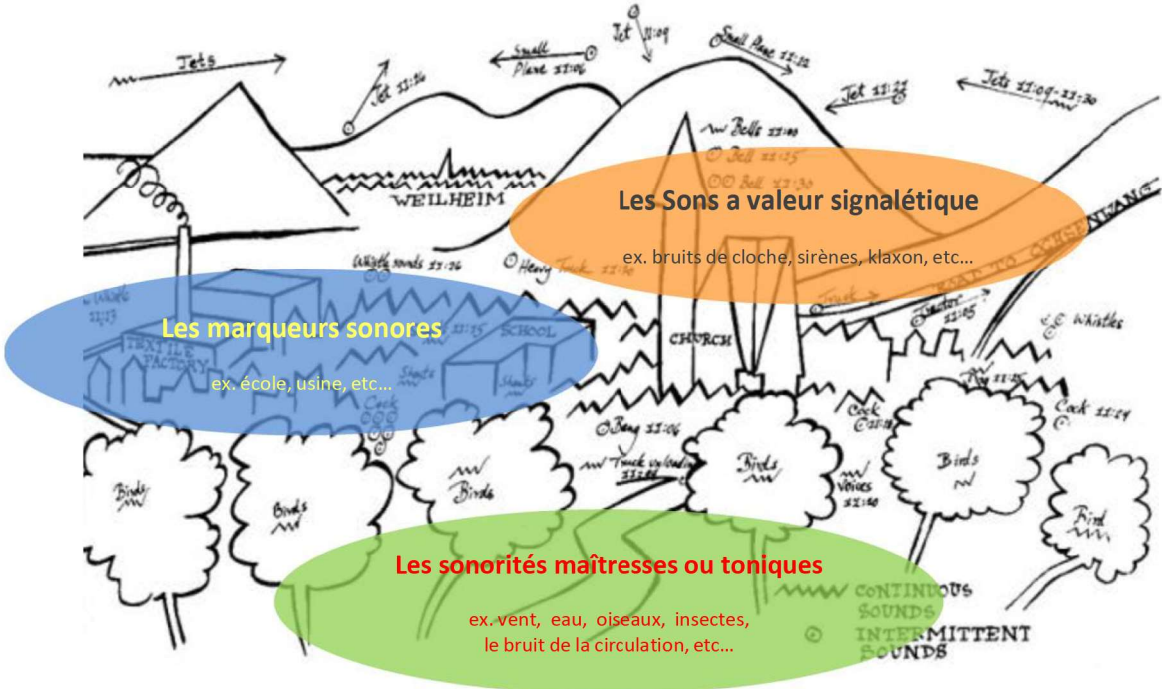
PAYSAGE SONORE ?

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Le Paysage Sonore selon R. Murray Schafer (1977)



- Concept de Paysage Sonore
 - 3 éléments principaux du «Soundscape»
- perception humaine

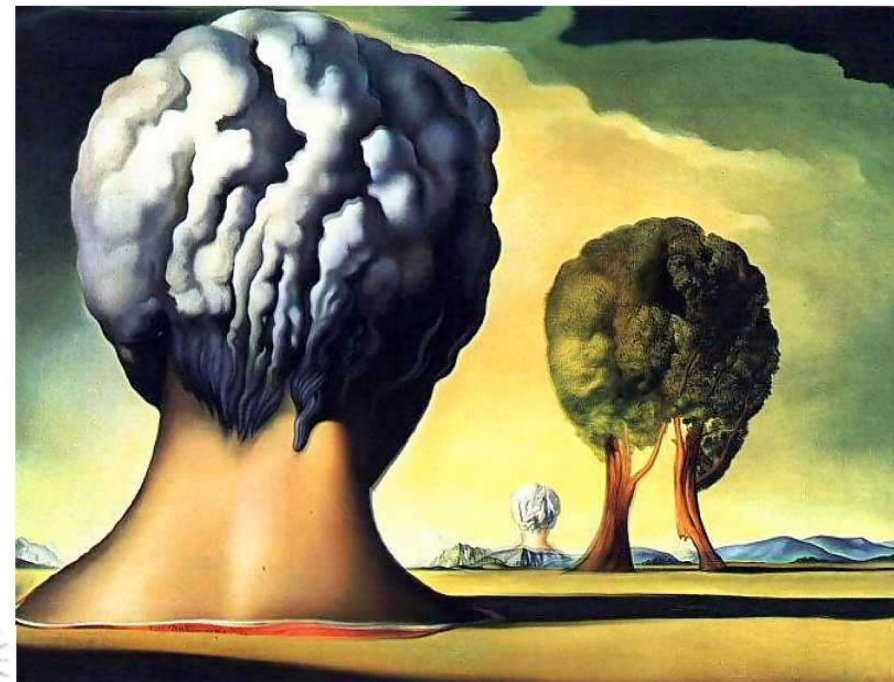


Identification de sources sonores

Notre système auditif recherche
des signatures sonores

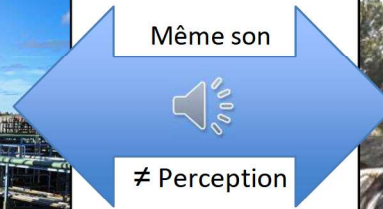
Processus cognitif

- dépendant du vécu et du contexte
- basé sur des caractéristiques fréquentielles et temporelles



Arbres, feuillage, nuages, têtes...?

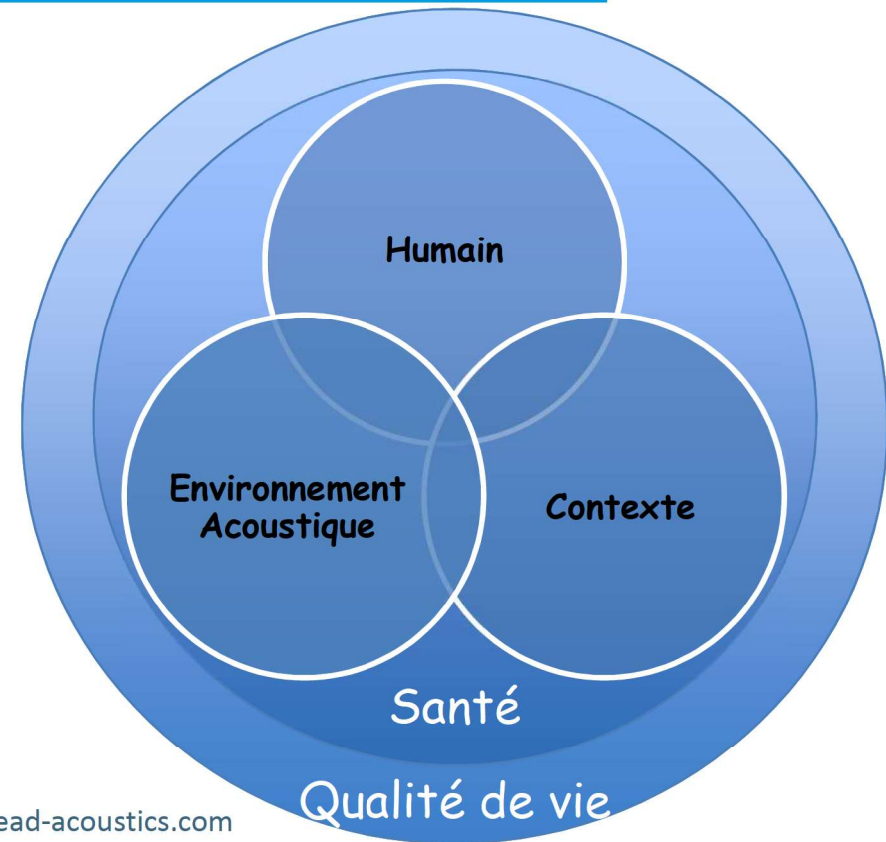
L'importance du contexte



Bergman, P., Västfjäll, D.,
Fransson, N., Sköld, A. (2008).
Emotion and meaning in
interpretation of sound
sources, Acoustics 08,
Proceedings, Paris, France

Le Paysage Sonore c'est...

- l'environnement acoustique
- perçu par l'humain
- dans son contexte



LA NORME ISO 12913

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Normalisation: ISO 12913

=un cadre pour la caractérisation acoustique de paysages sonores

Définition : « **Environnement Sonore** tel qu'il est perçu ou expérimenté ou compris par un ou des individus, dans un contexte »



- **NF EN ISO 12913-1:2014**
Acoustique - Paysage sonore - Partie 1: Définition et cadre conceptuel
- **ISO/TS 12913-2:2018**
Acoustique - Paysage sonore - Partie 2: Collecte de données
- **ISO/TS 12913-3:2019**
Acoustique - Paysage sonore - Partie 3: Analyse de données

ISO 12913-2 = Collecte des données ISO 12913-3 = Analyse des données



Exigences pour la collection et l'analyse des données				
ISO 12913-2	Parcours d'écoute	} et/ou	subjectif	informatif
ISO 12913-2	Questionnaire		subjectif	informatif
ISO 12913-2	Interview guidé		subjectif	informatif
ISO 12913-2	Mesures binaurales		objectif	normatif
ISO 12913-3	Indicateurs psychoacoustique		objectif	normatif

Parmi ces nouveaux outils, l'utilisation...
d'enregistrements binauraux et
d'analyses psychoacoustiques
 ...devient donc nécessaire pour l'analyse des paysages sonores.

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Parcours d'écoute ("Soundwalk")

- “méthode qui implique une promenade dans une zone en se concentrant sur l'écoute de l'environnement acoustique.”

ISO/TS 12913-2: Data collection and reporting requirements, ISO, Geneva, Switzerland, 2018





Questionnaires



For each of the 8 scales below, to what extent do you agree or disagree that the surrounding sound environment is ...
Please tick off one response alternative per scale

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
- pleasant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- chaotic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- vibrant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- uneventful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- calm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- annoying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- eventful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- monotonous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure C.4 — Questionnaire part 2 related to perceived sound environment

C.3.1.4 Questionnaire part 3: assessment of surrounding sound environment

Figure C.5 presents a five-point ordinal-category scale related to the environment.

Overall, how would you describe the present surrounding sound environment?

Very good	Good	Neither good, nor bad	Bad	Very bad
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure C.5 — Questionnaire part 3 related to the assessment of surrounding sound environment

C.3.2.3 Soundwalk data collection part 1: Assessment of the sound environment

The participants should assess a site on three different five-point unipolar continuous-categorical scales with additional verbal labelling ranging from "not at all" to "extremely". The participants should listen in silence for a defined period of time (e.g. 3 min) and to use all of their senses to assess the surrounding sound environment. The participants should assess their experiences on the scale below. They can provide an assessment at any location on the scale.

How loud is it here?
Mark your impression at any location on the scale below.

not at all	slightly	moderately	very	extremely
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How unpleasant is it here?
Mark your impression at any location on the scale below.

not at all	slightly	moderately	very	extremely
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How appropriate is the sound to the surrounding?
Mark your impression at any location on the scale below.

not at all	slightly	moderately	very	extremely
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How often would you like to visit this place again?
Mark your impression at any location on the scale below.

never	rarely	sometimes	often	very often
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Are there sounds which you cannot identify?
- During which times of the day and in which parts of the residence do different sounds interfere with each other? This question refers to both outside sounds as well as sound sources inside the residence.
- In this case, does one of the varying sound sources (from outside or inside) hide the others or are all the varying sound sources still distinctly audible?
- Are you under the impression that this is a cumulative effect?

g) Effects of various kinds of sounds upon moods and experience

- Are there sounds which stimulate or support you during certain activities and moods?
- Are there sounds which you appreciate to divert your attention from a given activity?
- When you find yourself reacting to unwanted sounds over a longer period of time, which emotions prevail?

Let the emotions be described first, then offer further descriptive terms:

Feelings of helplessness, weakness, wrath, anger with respect to the authorities, resignation.

- Could it be possible that the sounds contribute to tensions and conflicts with your co-inhabitants and/or neighbours?

- Do you feel that sound exposure could lead to health problems for you personally?

Ask the following only if specific statements regarding health impediments are being made:

- Do you believe that there is a relation between strong sound exposure and certain health impairments?

h) Assessment of the share that varying sounds have upon overall sound exposure

- How important is the sound exposure in your residential experience in relation to other exposures?
- Do you find that the sound exposure in your residential area with regards to living conditions here in general are common place or extraordinary?
- Do you incur financial disadvantages through this sound exposure?

Optional follow-up topics: Investments into soundproofing, depreciation of an apartment or a house, loss of time, diminishing productivity.

- Would you rather move if you were to find a comparable residence in a quieter residential area?

i) Actions to improve the residence with regards to sound exposure

- Which actions are you taking to hide from or avoid unwanted sounds?

First allow for a description of the measures taken, then offer additional examples (such as those that follow) and ask about effectiveness and effects:

Enregistrement binaural

- Les paysages sonores sont complexes (sources multiples de différents types, localisées à différents endroits, etc...)
- Un microphone seul ne peut pas représenter l'humain
- Les mesures acoustiques binaurales enregistrent le son comme si un auditeur humain était présent dans le champ sonore original, en conservant toutes les informations utiles à la perception des sons.



Le niveau ne suffit pas pour rendre compte des paysages sonores perçus !

- Les paysages sonores sont complexes
- La perception est un phénomène multidimensionnel
- Le seul niveau sonore ne suffit pas à rendre compte de la perception !



Analyses : Indicateurs Psychoacoustiques

Table D.1 – Metrics and representative single values

- Le calcul de Indicateurs psychoacoustiques permet de rendre compte de la complexité de la perception humaine

Parameter	Metrics to be determined for each channel separately	Determination of representative single value	Reference
Sound pressure level	$L_{Aeq,T}, L_{Ceq,T}, L_{AF5,T}, L_{AF95,T}$	higher value of left and right metric values	ISO 1996-1 [55]
Loudness (time-variant loudness) Sonie	$N_5, N_{average}, N_{rmc}, N_{95}, \frac{N_5}{N_{95}}$	higher value of left and right metric values (or the average of left and right metric values)	ISO 532-1 [54]
Sharpness Acuité	$S_5, S_{average}, S_{95}$	higher value of left and right metric values (or the average of left and right metric values)	DIN 45692 [56]
Psychoacoustic tonality Caractère tonal	T	higher value of left and right metric values (or the average of left and right metric values)	ECMA 74 [57]
Roughness Rugosité	R_{10}, R_{50}	higher value of left and right metric values (or the average of left and right metric values)	[32]
Fluctuation strength Fluctuation d'intensité	F_{10}, F_{50}	higher value of left and right metric values (or the average of left and right metric values)	[32]

EXEMPLE D'ÉVALUATION DE PAYSAGE SONORE SELON ISO 12913

Outils orientés perception



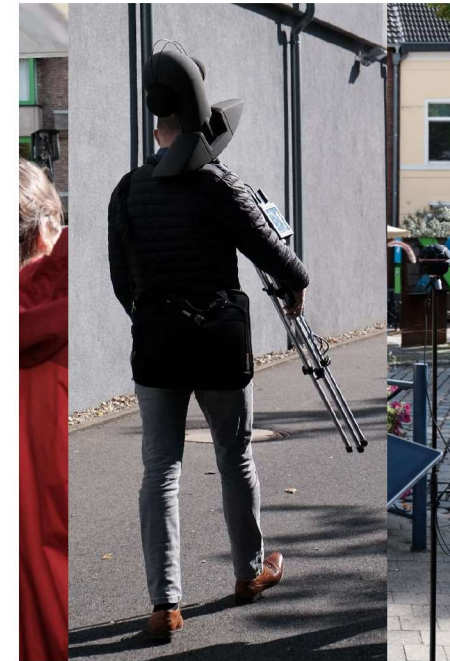
BSU

Estimation de la gêne due au bruit par le calcul et par l'écoute en prenant en compte la perception humaine



HEADscape

Mannequin Binaural + Webcam + GPS





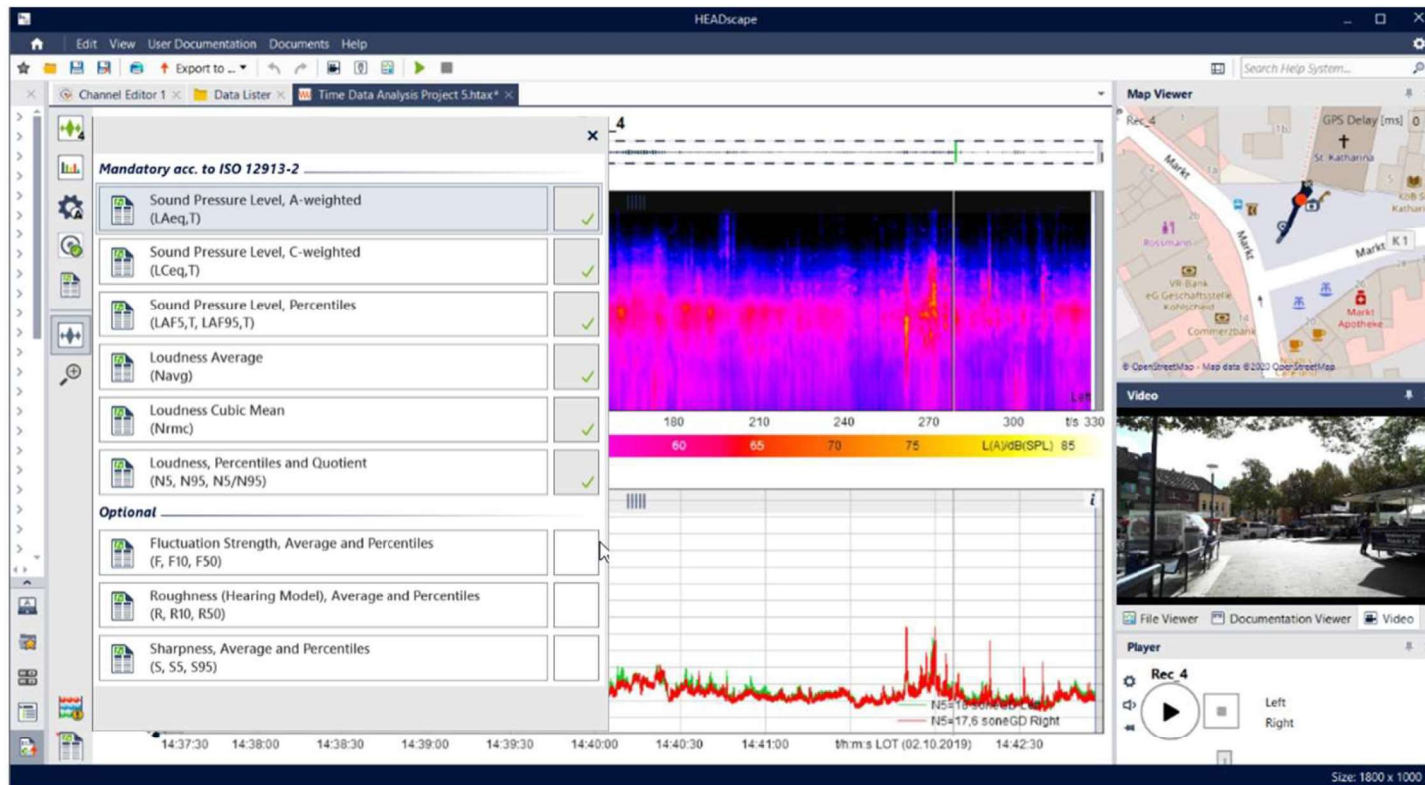
Assises Nationales
de la Qualité de l'Environnement
Sonore

9^e ÉDITION
INVESTISSONS [DANS]
L'ENVIRONNEMENT SONORE !

CidB
Centre d'Information
sur le bruit

MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE
ET SOLIDAIRE

Logiciel HEADScape



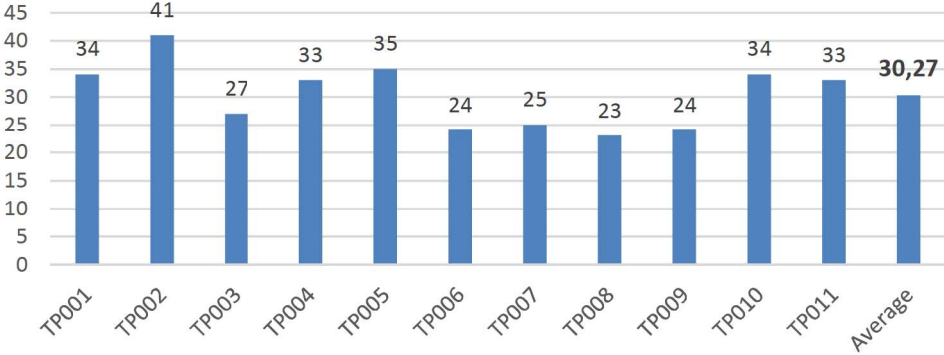
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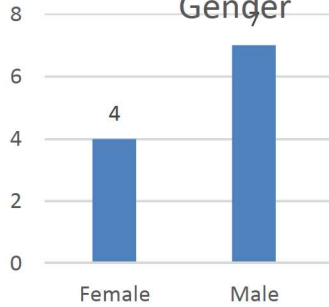
Participants



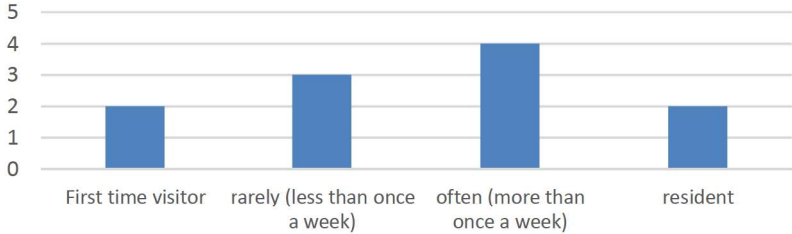
Age



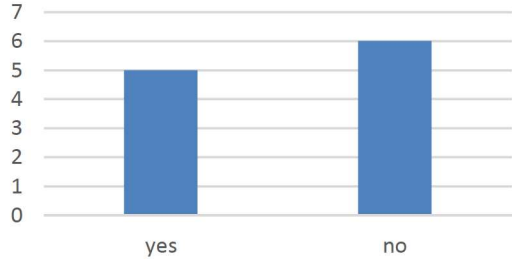
Gender



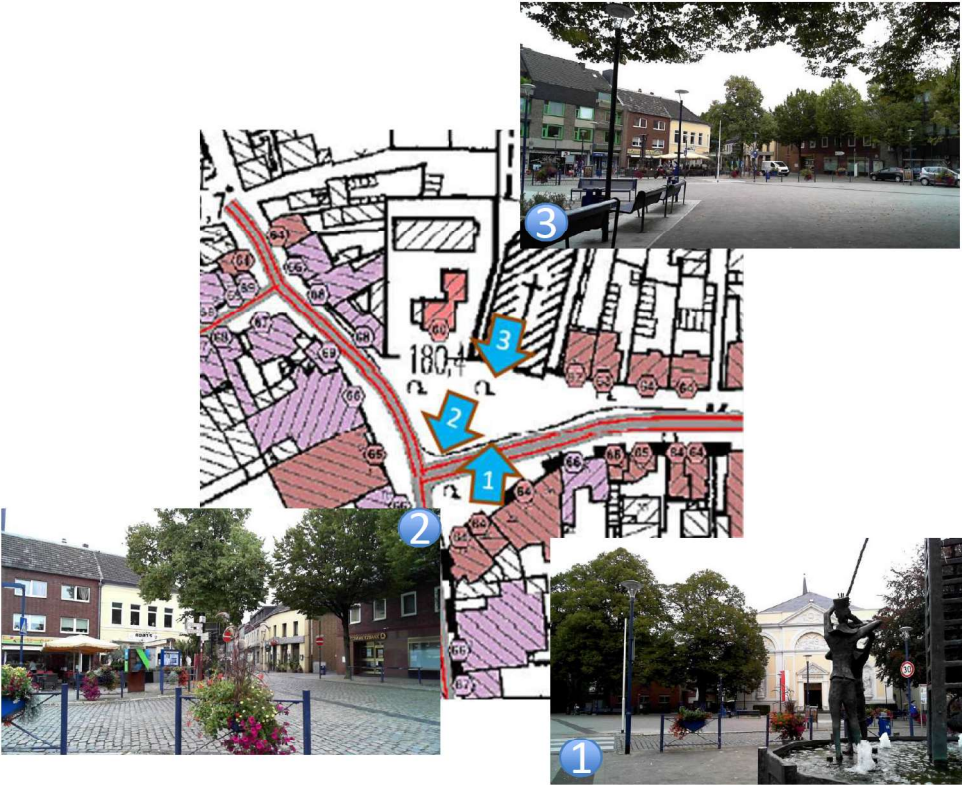
How often do you visit this place



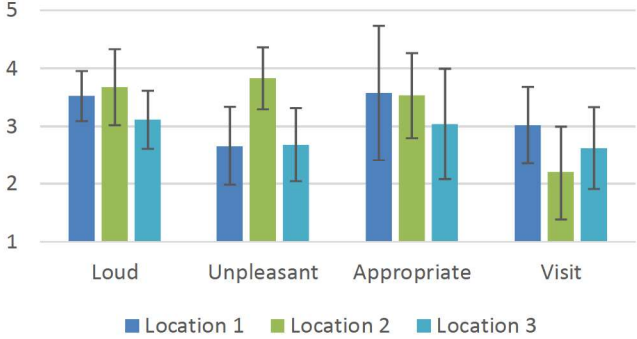
Trained listener



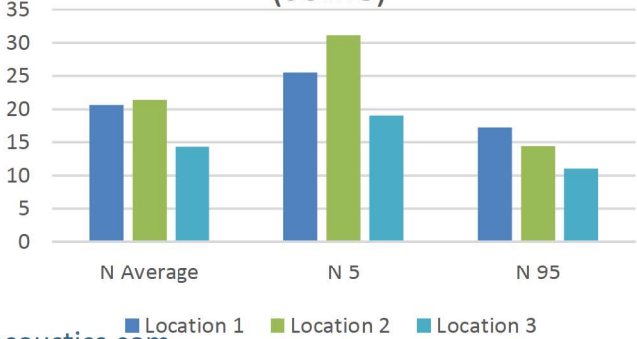
Résultats



Questionnaire



Loudness (sonie)



Résumé

- L'approche du paysage sonore selon ISO 12913, tout en laissant de la marge de manœuvre à l'expérimentateur, fournit ...
 - un vocabulaire commun
 - une manière normalisée de collecter des **données subjectives et objectives pertinentes**
 - Permettant une description précise de l'endroit étudié
 - prenant en compte la **perception humaine**, et
 - permettant d'obtenir des **résultats reproductibles et comparables** entre laboratoires

MERCI DE VOTRE ATTENTION!