

WIND COMFORT ANALYSIS FOR ODDE



Disclaimer

While Sweco considers that the information and opinions given in this work are sound, all parties must rely upon their own skill and judgment when making use of it. Sweco does not make any representation or warranty, expressed or implied, as to the accuracy or completeness of the information contained in this report and assumes no responsibility for the accuracy or completeness of such information. Sweco will not assume any liability to anyone for any loss or damage arising out of the provision of this report.

This report is intended for use by the Cleint only, and Sweco does not take any responsibility for any liabilities as a consequence of use by other parties. If other parties will read or use this report including its annexes as a base for decisions, a reliance letter must be issued by Sweco.

Copyright © 2017 Sweco Energuide AB

All rights reserved

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without the prior written permission of Sweco Energuide AB.

Prepared by: Gabriella Nilsson

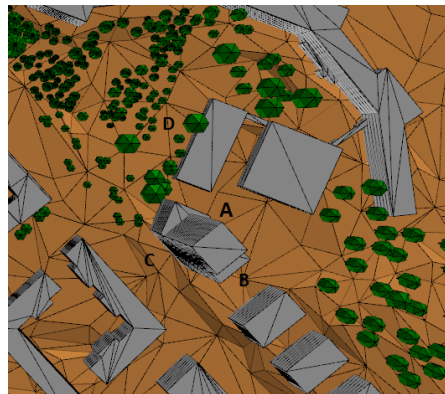
Reviewed by: Martin Danielsson

Revision history

Version	Delivery date	Description
A	2016-12-23	Original report, Odde_daylight and wind_161223
B	2017-09-28	Simulation based on the new project plan. Wind comfort results are presented only for Kvarter B.
C	2017-10-13	Simulation taking the balconies into account. Summer period is set to May-September

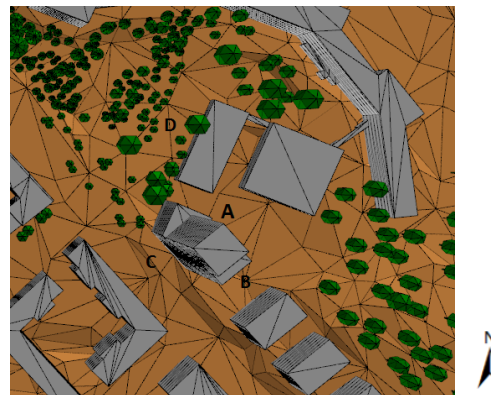
1. Conclusions and Recommendations, kvarter B

Conclusion	Recommendation
A- Main square-area between höghus H5, motionshall and matsal	It is clear that the building shell (mantelbyggnad) at house H5 limits the westerly winds very well. This creates a comfortable wind climate east of the house where the main square is planned. This area is tolerable for short term sitting and for strolling, in total it is fine concerning wind comfort. There might be some windy spots at the comers of house H5 and close to the park entrance (Parkentré). No difference between winter- and summer time. No mitigation is needed.
B- Parkentré	<p>Close to the house, where outdoor areas for the rental premises at ground plane are planned (maximum 3 m from the house facade), the wind comfort is fine. If sitting activities are planned further from the building some form of mitigation is needed, preferably vegetation. At the square, small hills with trees are planned in order to mitigate the traffic. The more windy spots here coincides rather well with the locations of these hills, which is an advantage for the wind comfort since it is assumed to decrease the wind speed and wind gusts.</p> <p>No major difference between winter- and summertime.</p>



1. Conclusions and Recommendations, kvarter B

Conclusion	Recommendation
C- Kista Alléväg	Along Kista Alléväg it can be windy close to the höghus H5. This part of the road is unpleasant for short-term sitting but will be fine for strolling and cycling. This wind comfort in this area is slightly better in summertime than in winter time. If the area is intended for sitting activities some form of mitigation is needed, for example trees. No major difference between winter- and summertime.
D- IBM-parken	Most parts of the area is fine concerning wind comfort except for the parts mentioned in Parkentré and Kista Alléväg above. There is also a spot at the northern corner of house H5 that might be unpleasant for short term sitting. Consider if more vegetation should be used in this area. No difference between winter- and summer time.



2. Methodology

The main objective of this analysis is to conclude on the wind comfort level in the outdoor areas of the Odde project. The methodology used to simulate the wind comfort is described in the following sections.

2.1 Simulation model and input data

The modeling of the flow characteristics has been conducted based on a Computational Fluid Dynamics (CFD) model available through the UrbaWind64 software. The data described in the table below have been used as input to the model calculations.

Input data	Description	Source
Buildings in the project area	Extracted from 3D surface data provided in DWG format.	Strategisk Arkitektur
Neighbor buildings	Extracted from 3D surface data provided in DWG format. The closest neighbor buildings have been considered.	Strategisk Arkitektur
Terrain elevation	3D drawing in STL format. The data file were simplified in order to reduce size of file. Terrain elevation data cover an area of 1.5 km x 1.5 km centered on the project area	SMHI
Vegetation	Extracted from 3D surface data provided in DWG format.	Strategisk Arkitektur
Climatology	Modelled wind speed and direction data for the grid point with coordinates X:6 589 504, Y:666 702 (SWEREF99 TM), for the period 1993 – 2015.	ConWx Mesoscale Data

2.2 The Davenport wind comfort criterion

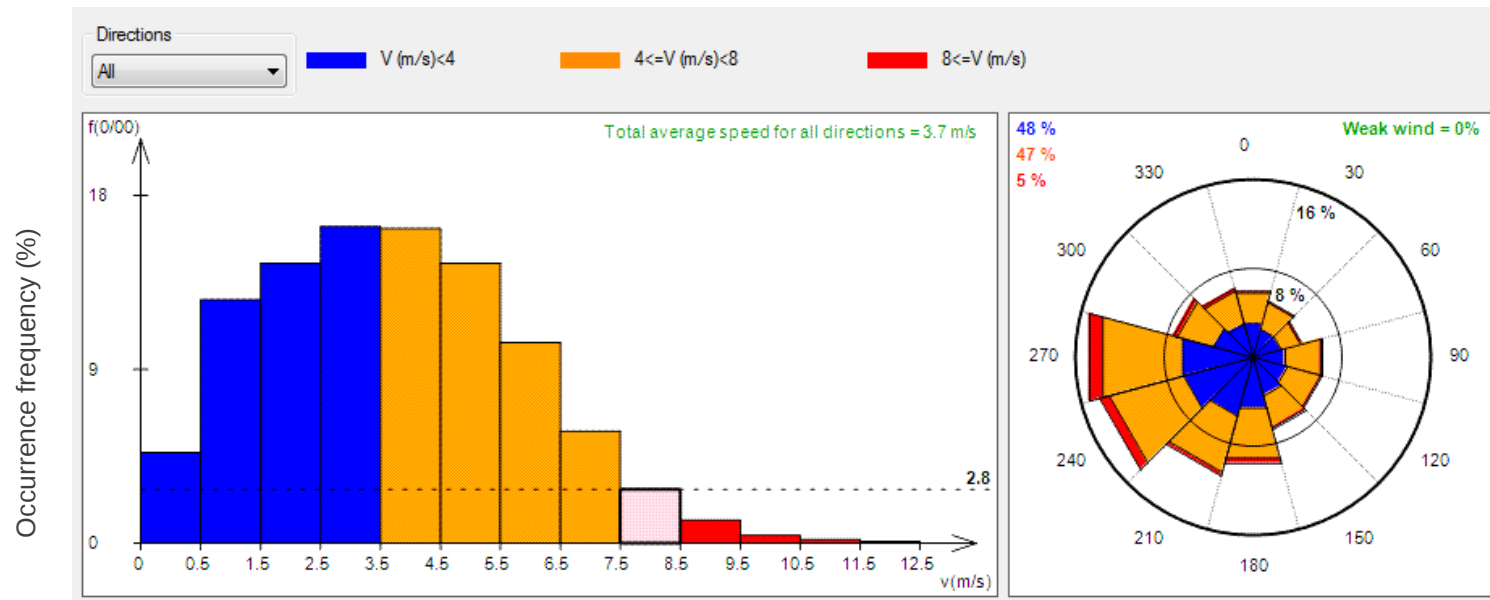
- Wind comfort in different environments is typically assessed based on the Davenport comfort criterion.
- The Davenport comfort criterion has been defined by Davenport (1972) [1] for different pedestrian activities as presented in the table below.
- This criterion gives the maximum percentage of time during which the perceived wind speed may exceed 5 m/s during a normal wind year.

Activity	Davenport criterion			
	Tolerable	Unpleasant	Harmful	
Cycling, walking fast	0 %	43 %	50 %	53 %
Strolling	0 %	23 %	34 %	53 %
Sitting for a short period of time	0 %	6 %	15 %	53 %
Sitting for a long period of time	0 %	0.1 %	3 %	53 %

3.1 Long-term wind conditions at the site

3.1.2 Complete year

- Regarding the complete year, the predominant wind direction is westerly and southwesterly wind are most frequent.
- The long-term mean wind speed for a complete year is 3.7 m/s at 10 m above ground level.



Wind speed histogram

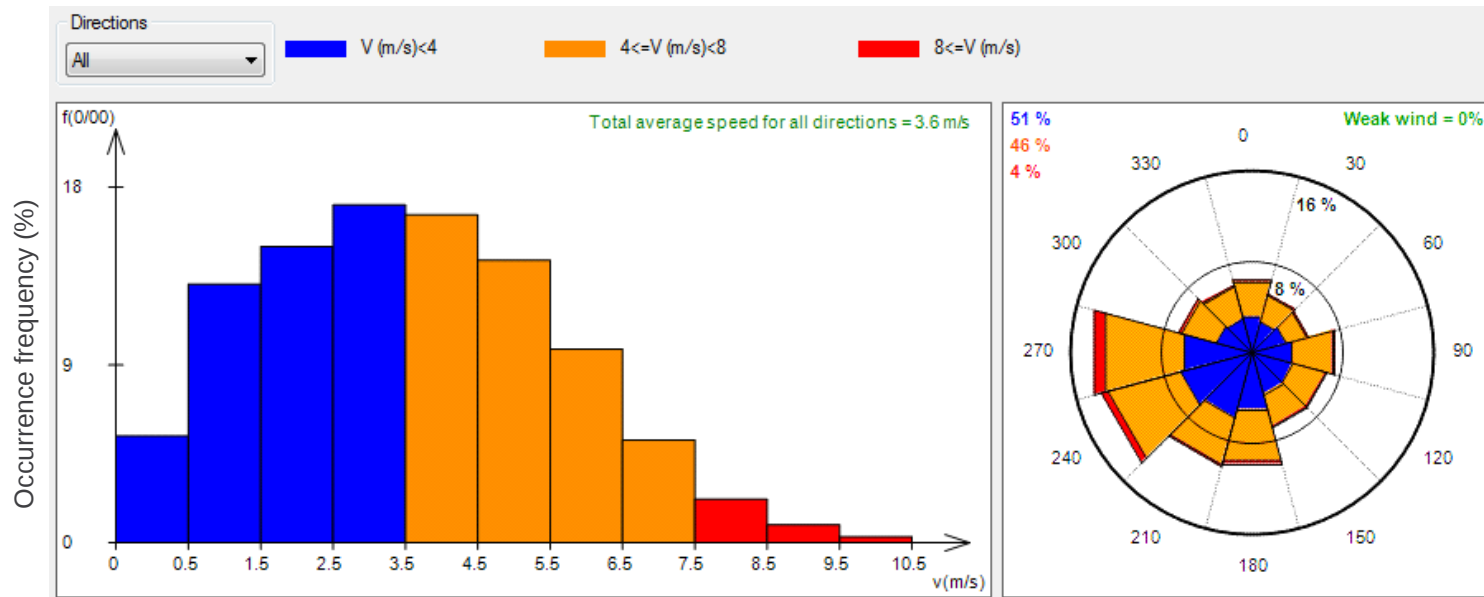
Wind speed rose

3. Results

3.1 Long-term wind conditions at the site

3.1.1 May to September period

- The predominant wind direction during May to September is west, southwest also being relatively frequent.
- The long-term mean wind speed for the period May to September is 3.6 m/s at 10 m above ground level.

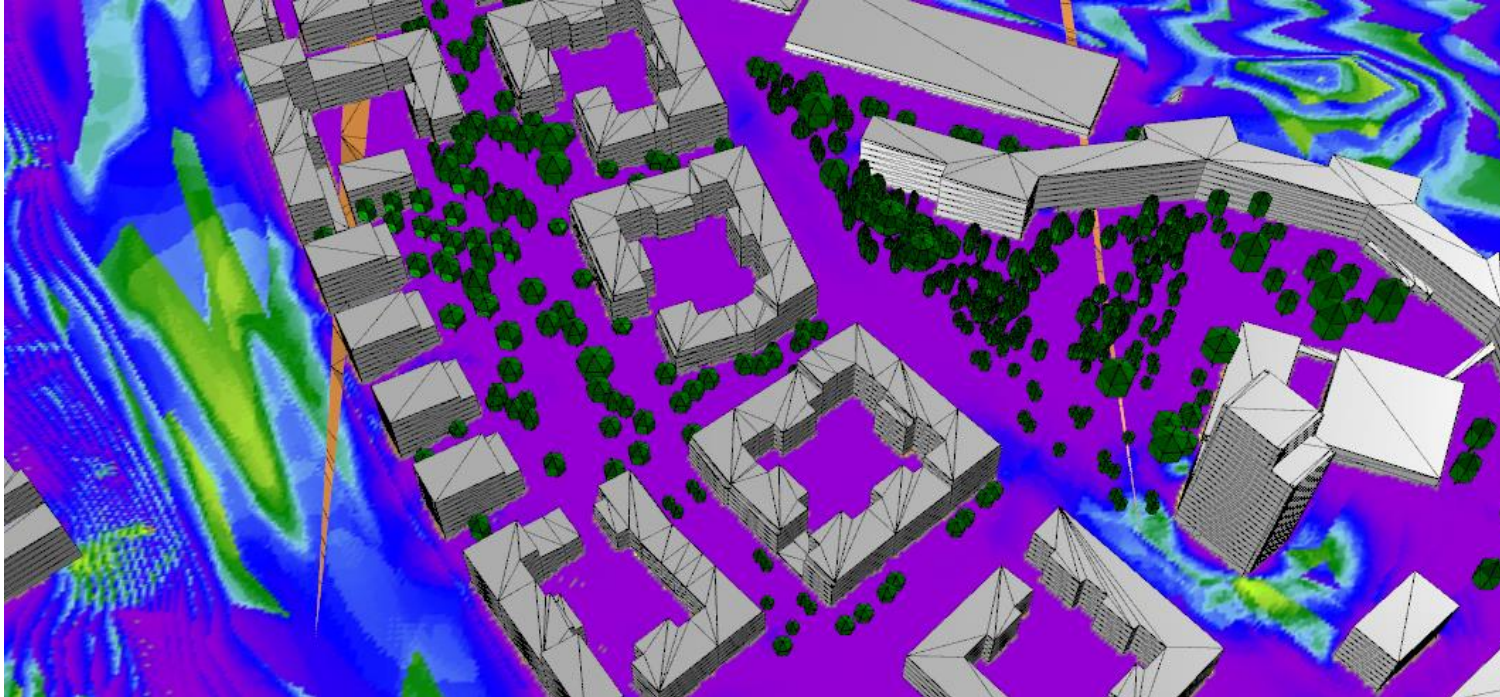


Wind speed histogram

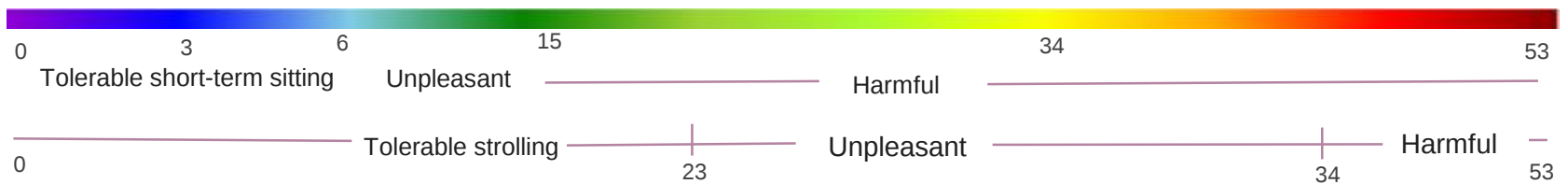
Wind speed rose

3.5 Wind comfort - Overview of the entire area

5.2 During a normal year

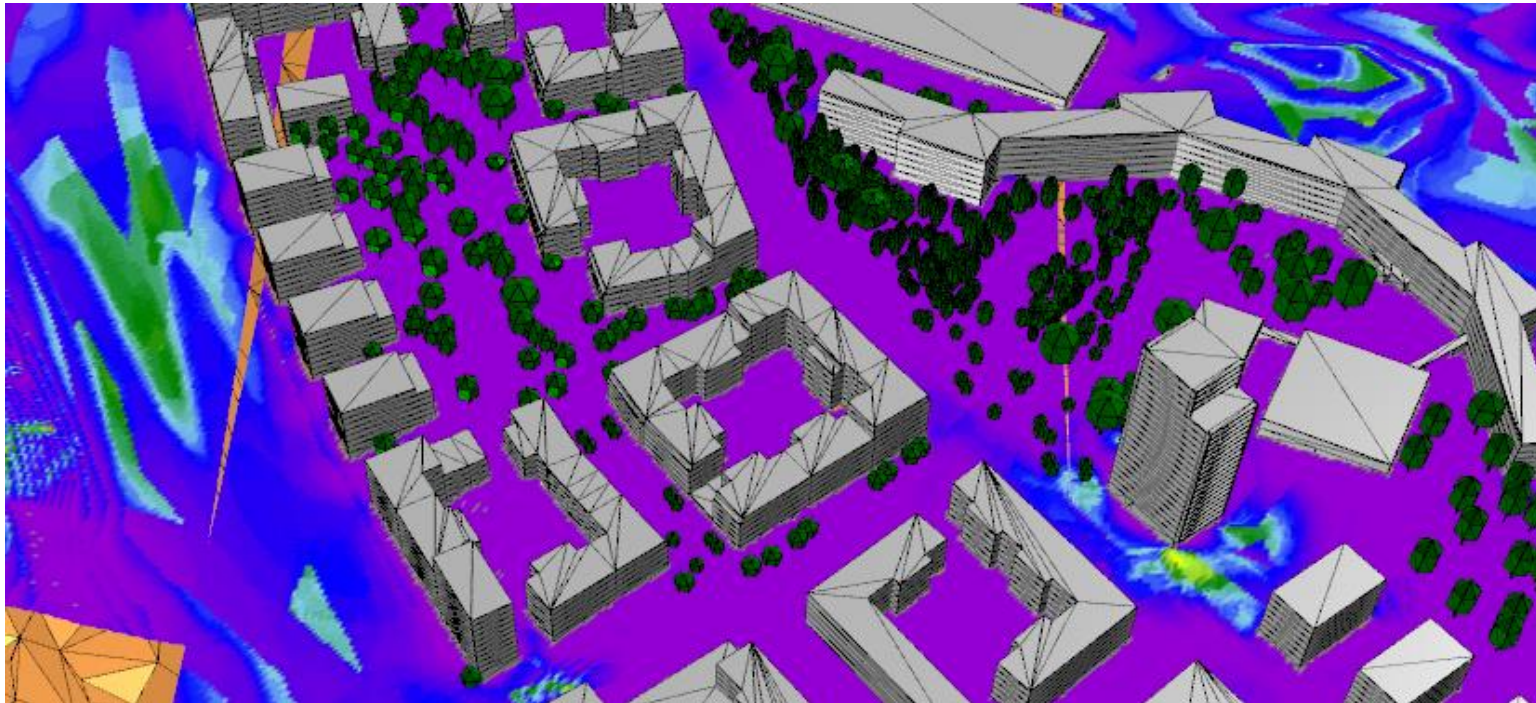


Percentage of time (%) when the perceived wind speed exceeds 5 m/s

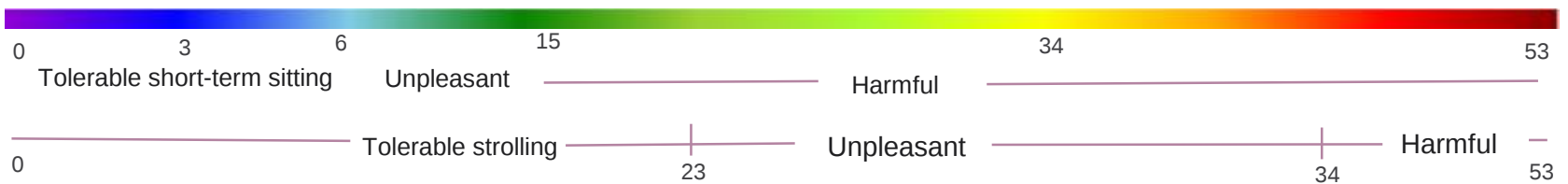


3.5 Wind comfort - Overview of the entire area

5.2 During May- September

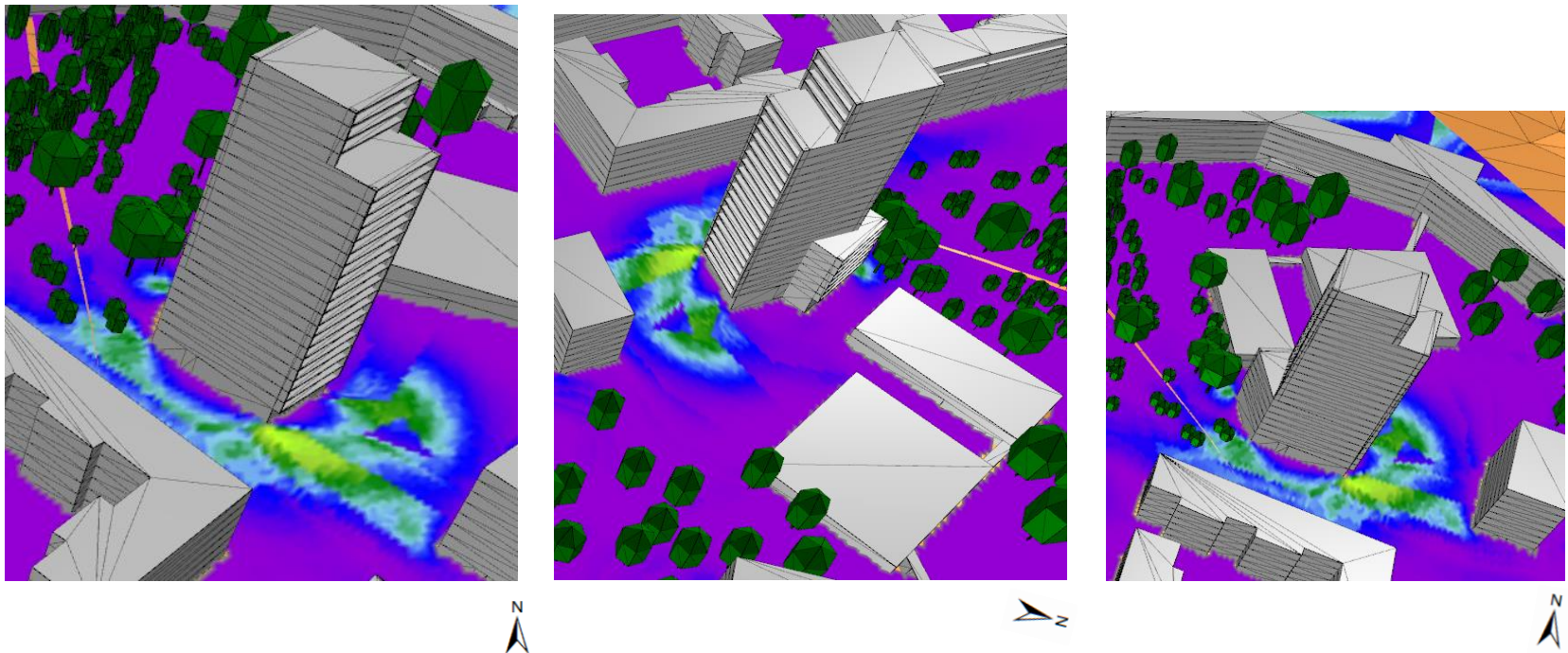


Percentage of time (%) when the perceived wind speed exceeds 5 m/s

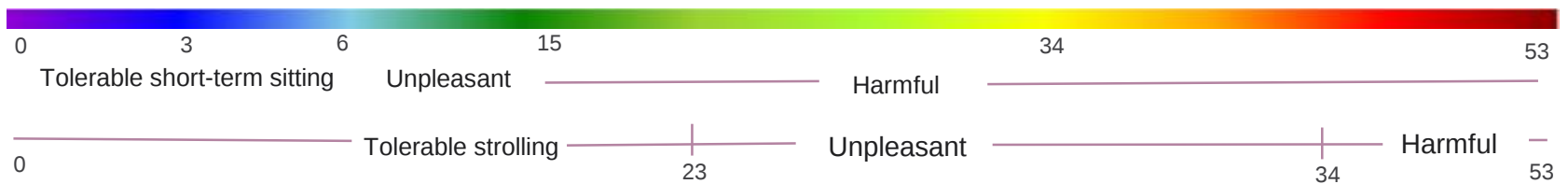


3.5 Wind comfort - Overview of kvarter B

3.5.2 During a normal year

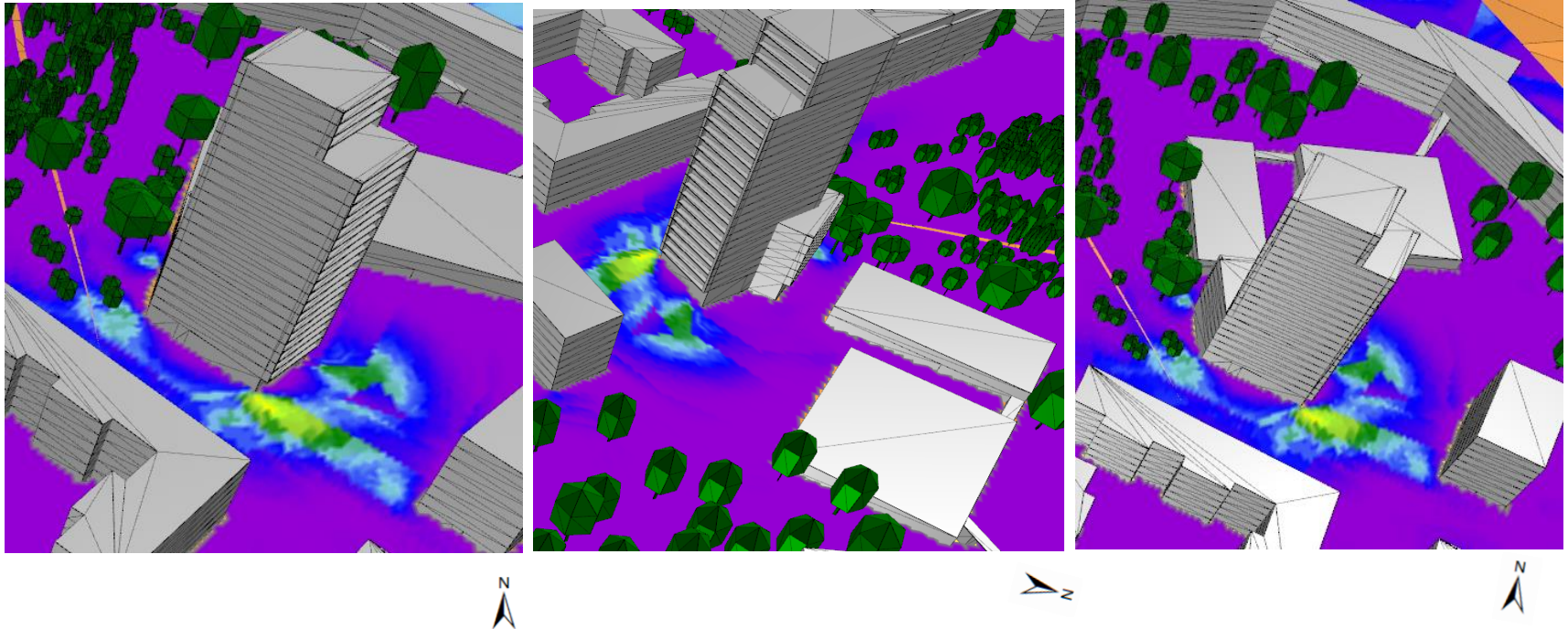


Percentage of time (%) when the perceived wind speed exceeds 5 m/s

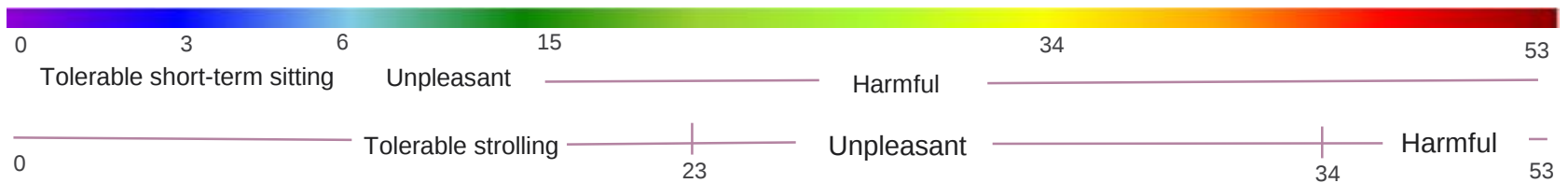


3.5 Wind comfort - Overview of kvarter B

3.5.2 During May-September



Percentage of time (%) when the perceived wind speed exceeds 5 m/s



Bibliography

[1] Davenport, A. G. An approach to human comfort criteria for environmental wind conditions, Proc. CIB/WMO Colloquium Teaching the Teachers, Swedish National Building Institute, Stockholm, 1972