



**Prevention of
health damage
caused by the sun**

-

**Structural prevention
in urban and
rural areas**

Policy paper

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Preamble

Without the sun, life on earth would not be possible. But, sunshine also poses risks to human health. Ultraviolet (UV) radiation of the sun initiates the endogenous synthesis of Vitamin D, but simultaneously leads to damage of eyes and skin, and causes cancer. The International Agency for Research on Cancer (IARC) has classified UV radiation as a Class I carcinogen (“carcinogenic to humans”)¹. UV-related diseases sustainably burden the welfare of the public and result in high, steadily rising health care costs. Climate change associated weather modifications and extreme weather events can intensify this problem even more.

The medical profession and institutions for radiation protection agree that the prevention of UV-related diseases, especially of UV-induced skin cancer, is a radiation protection and health objective that must be considered within the meaning of the German Preventive Healthcare Act (PrävG)², the German Early Detection and Registration of Cancer Act – KFRG³ and the German Patient Rights Act⁴.

The institutions of the UV Protection Alliance (<http://www.bfs.de/EN/> → UV Protection Alliance) have therefore authored this policy paper. Its objective is to establish nationwide structural prevention measures in the open, in outdoor areas of public facilities, and in various living environments⁵ of the public to protect against excessive UV exposure as well as against further, due to climate change increasing harmful impacts of the sun (e. g. heat stress)⁶. The development and establishment of the measures should be implemented with consideration of the necessary synergies of behavioural and structural prevention as well as aspects of environmental justice.

With this paper, the UV Protection Alliance addresses the social insurance carriers and social partners, public utility providers, the training or training coordination organisations, and the media. In a joint cooperation and with utilization of the means and possibilities available to the individual addressees it should be ensured that citizens of all ages can find protection against excessive UV exposure and – if this is possible with UV minimizing measures – also against excessive heat stress in the open.

¹ El Ghissassi, F., et al., A review of human carcinogens--part D: radiation. *Lancet Oncol*, 2009. **10**(8): p. 751-752.

² Legislation to reinforce health promotion and prevention. *Federal Law Gazette Volume 2015 Part I No. 31*. 1368-1379.

³ Legislation to further development the early detection of cancer and for quality assurance through the clinical cancer register (early detection and registration of cancer legislation – KFRG). *Federal Law Gazette Volume 2013 Part I No. 16*. 617-623.

⁴ Legislation to improve the rights of patients. *Federal Law Gazette Volume 2013 Part I No. 9*. 277-282.

⁵ Living environments in the sense of Article 20, Para. 4, No. 2 PrävG and Social Law Book V are defined as health-relevant distinct social systems, especially of housing, learning, studying, medical and nursing care as well as of recreation activities including sport.

⁶ Eis D, Helm D, Laussmann D, Stark K (2010) Klimawandel und Gesundheit – Ein Sachstandsbericht [Climate change and health – a status report]. Robert Koch Institute, Berlin
http://www.rki.de/DE/Content/Gesund/Umwelteinfluesse/Klimawandel/Klimawandel-Gesundheit-Sachstandsbericht.pdf?__blob=publicationFile. (Access on 20 April 2018).

Background

UV radiation has an impact on human and causes positive and negative health consequences. Primarily affected are the eyes and the skin. The health effects of UV radiation depend on, among other things, on how deep the UV radiation penetrates the tissue.

In skin, UV radiation with wavelengths of 280 nm to 315 nm (UVB radiation) penetrates the epidermis. UV radiation with wavelengths of 315 nm to 400 nm (UVA radiation) reaches deeper tissue layers and penetrates to the dermis (see Fig. 1)⁷.

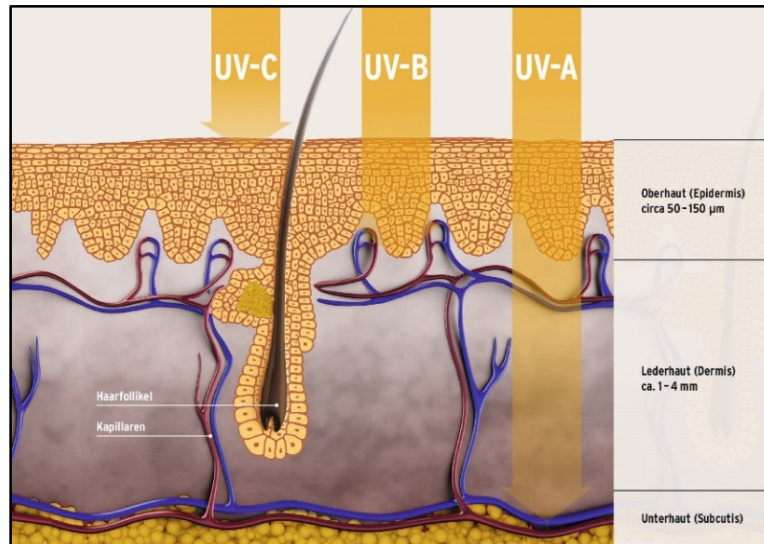


Fig. 1: Penetration depth of UV radiation into the skin (Image: BfS 2016)

In the eyes of adults, UVB and UVA radiation (315 nm to 365 nm) is completely taken in (absorbed) by the lens.

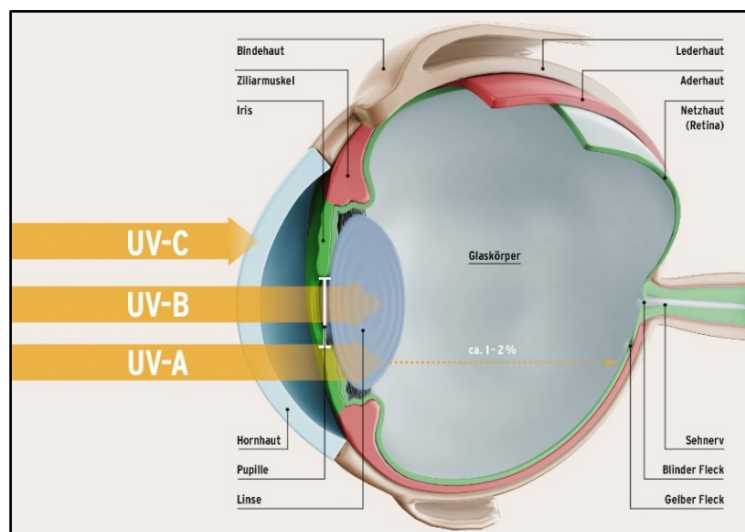


Fig. 2: Penetration depth of UV radiation into the eye (Image: BfS 2016)

One to two per cent of UVA radiation with wavelengths of 365 nm to 400 nm penetrates to the retina (see Fig. 2). In the eyes of children and young people, there is still a narrow transmission window around 320 nm. As a result, beginning with birth this wavelength

⁷ The UV-C radiation from the sun does not reach the earth's surface and therefore requires no further consideration here.

range penetrates to children's retina and to the retina of young people. The window closes by the age of 30. It is so far discussed which health consequences this entails. It cannot be ruled out that in a child's ocular fundus this UV exposure can create the prerequisites for eye diseases occurring in later life. Accordingly, the child's eye needs specially protection to prevent UV-related eye damage⁸.

In the cells of skin and eye, UV radiation is absorbed and causes various changes there. The most important change is the damage of the genome (DNA) by UV radiation even at low doses. Special cell systems usually repair this DNA damage. But, frequent, long-lasting and intensive UV radiation as well as sunburn can overburden these repair systems, and the set damage cannot longer be repaired entirely and/or correctly. Cells with such damaged DNA can degenerate into cancer cells. In 2009, the International Agency for Research on Cancer (IARC) classified solar UV radiation and artificial UV radiation in sunbeds as the highest risk group 1 "carcinogenic to humans"⁹.

The skin cancer incidence due to UV exposure has increased many times in recent decades – and that tendency continues to rise. Extrapolations based on the data of the Cancer Registry Schleswig-Holstein of 2016 showed that in Germany around 265,000 people were diagnosed with skin cancer in 2013¹⁰, of which about 235,000 were of non-melanoma skin cancer (about 148,000 basal cell carcinomas, around 87,000 squamous cell carcinomas) and around 31,000 of the "black" skin cancer", the malignant melanoma. In 2012, almost 1.6 million people in Germany were affected by a skin cancer diagnosis¹¹. Since 2015, in Germany squamous cell carcinoma and multiple actinic keratosis have been recognised as occupational diseases¹². Annually, around 3,000 people die from skin cancer¹³, mainly from malignant melanoma. Risk factors are sunburn (primarily in childhood), intermittent high level UV exposure (sunshine during annual holidays on non-adapted skin), the lifelong UV dose and sunbed use¹⁴. Skin cancer diseases lead to high costs, which put a heavy burden on healthcare and public welfare. In 2002, the health care costs in the hospital sector just for melanoma and other malignant skin neoplasms ran to 311 million euros and by 2008 to 503 million euros according to the German Federal Statistical Office¹⁵.

⁸ Glickman, R.D., Ultraviolet phototoxicity to the retina. *Eye Contact Lens*, 2011. 37(4): p. 196-205.

⁹ El Ghissassi, F., et al., A review of human carcinogens--part D: radiation. *Lancet Oncol*, 2009. 10(8): p. 751-752.

¹⁰ Katalinic A. Aktuelle Zahlen zur Epidemiologie von Melanomen und Hellem Hautkrebs [Current figures for the epidemiology of melanoma and non-melanoma skin cancer]. http://www.krebsregister-sh.de/aktuelles/Zahlen_Hautkrebs_2016.pdf (Access on 20 April 2018).

¹¹ Grobe T. G, Heller G, Szecsenyi J, BARMER GEK Arztreport 2014 Schwerpunkt: Hautkrebs [Medical Report 2014 Focus: Skin Cancer], BARMER GEK Berlin (Ed.), Asgard-Verlagsservice GmbH, Siegburg, ISBN: 978-3-943-74489-7.

¹² Federal Law Gazette Volume 2014 Part I No. 62, p. 2397, issued to Bonn on 29 December 2014.

¹³ Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V. Atlas der Krebsinzidenz und –mortalität in Deutschland [Atlas of epidemiological cancer incidence and mortality in Germany] (GEKID-Atlas). Provision of data: December 2013, Lübeck, 2014. Available from: <http://www.gekid.de>.

¹⁴ Oncology guidelines programme (German Cancer Society, German Cancer Aid, AWMF [Association of the Scientific Medical Societies in Germany]): S3-Leitlinie Prävention von Hautkrebs [S3 Guideline Prevention of Skin Cancer], long version 1.0, 2014, AWMF registration number: 032/052OL, <http://leitlinienprogramm-onkologie.de/Hautkrebs-Prävention.56.0.html> (Access on 20 April 2018).

Boniol, M., et al., Cutaneous melanoma attributable to sunbed use: systematic review and meta-analysis. *BMJ*, 2012. 345: p. e4757. Boniol, M., et al., Correction. *BMJ*, 2012. 345: p. e8503

¹⁵ Federal Statistical Office Wiesbaden. Health – Illness costs. Series 12, Number 7.2, 2002-2008. 2010. Item number: 2127020089004.

In the eye, the formation of cataract is attributed to the long-term effects of natural UV radiation¹⁶. Besides cataract, there are further eye diseases in whose formation UV radiation is likely to be involved. These include pterygium¹⁷, palpebral fissure spots (pinguecula)¹⁸, skin tumours on the eyelids¹⁹, and squamous cell carcinomas on the conjunctiva²⁰. Regarding degenerative retina diseases such as Stargardt disease and age-related macular degeneration, the participation of UV radiation has not yet been completely ruled out²¹. UV radiation is also discussed as a risk factor for the appearance of choroidal melanoma (malignant uveal melanoma)²². There are currently no detailed statistics available on the health care costs resulting from these diseases and thus on their consequential burden on the healthcare system. The reports of the German Federal Statistical Office indicate only that the health care costs for malignant neoplasms (ICD-Code C00-C97, of which ICD-Code C69 is “malignant neoplasms of the eye and the eye appendages”) were around 11.4 billion euros in 2002 and already 15.4 billion euros in 2008.

The reason for the increasing skin and eye cancer incidence is mainly seen in high UV exposure due to people’s leisure behaviour, in which the high level of UV exposure at outdoor work also plays a role. Staying too long in the sun without proper sun protection means excessive, harmful UV exposure. In particular, the fact that children are especially at risk here, urges preventive measures.

The situation gets just worth worldwide. In the course of global warming due to climate change, which will presumably cause more serious health consequences²³, it can be assumed that increased daily outdoor activities will take place and this is likely to lead to increased UV exposure²⁴. Another consequence of climate change are so-called

¹⁶ Wang, Y., et al., *The relationship between the disability prevalence of cataracts and ambient erythemal ultraviolet radiation in China*. PLoS One, 2012. **7**(11): p. e51137.

¹⁷ Threlfall, T.J. and D.R. English, *Sun exposure and pterygium of the eye: a dose-response curve*. Am J Ophthalmol, 1999. **128**(3): p. 280-287.

¹⁸ Norn, M.S., *Prevalence of pinguecula in Greenland and in Copenhagen, and its relation to pterygium and spheroid degeneration*. Acta Ophthalmol (Copenh), 1979. **57**(1): p. 96-105.

Norn, M.S., *Spheroid degeneration, pinguecula, and pterygium among Arabs in the Red Sea territory, Jordan*. Acta Ophthalmol (Copenh), 1982. **60**(6): p. 949-954.

¹⁹ Yam, J.C. and A.K. Kwok, *Ultraviolet light and ocular diseases*. International ophthalmology, 2014. **34**(2): p. 383-400

²⁰ Kusewitt, D.F., et al., *Cellular origins of ultraviolet radiation-induced corneal tumours in the grey, short-tailed South American opossum (Monodelphis domestica)*. J Comp Pathol, 2000. **123**(2-3): p. 88-95.

Newton, R., et al., *Effect of ambient solar ultraviolet radiation on incidence of squamous-cell carcinoma of the eye*. Lancet, 1996. **347**(9013): p. 1450-1451.

²¹ Sui, G.Y., et al., *Is sunlight exposure a risk factor for age-related macular degeneration? A systematic review and meta-analysis*. The British journal of ophthalmology, 2013. **97**(4): p. 389-394.

²² Stang, A., et al., *Population-based incidence estimates of uveal melanoma in Germany. Supplementing cancer registry data by case-control data*. European journal of cancer prevention: the official journal of the European Cancer Prevention Organisation, 2006. **15**(2): p. 165-170.

Schmidt-Pokrzywniak, A., et al., *Positive interaction between light iris color and ultraviolet radiation in relation to the risk of uveal melanoma: a case-control study*. Ophthalmology, 2009. **116**(2): p. 340-348.

Mallet, J. D., et al., (2014), *Implication of ultraviolet light in the etiology of uveal melanoma: A review*. Photochem Photobiol, 2014. **90**: p. 15–21. doi:10.1111/php.12161.

²³ Eis D, Helm D, Laussmann D, Stark K (2010) Klimawandel und Gesundheit – Ein Sachstandsbericht [Climate change and health – a status report]. Robert Koch Institute, Berlin

http://www.rki.de/DE/Content/Gesund/Umwelteinfluesse/Klimawandel/Klimawandel-Gesundheit-Sachstandsbericht.pdf?__blob=publicationFile (Access on 20 April 2018).

²⁴ Federal Government (2008) Deutsche Anpassungsstrategie an den Klimawandel [German strategies for adapting to climate change]. Berlin. http://www.bmub.bund.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/das_gesamt_bf.pdf (Access on 20 April 2018).

Kandarr J, Reckert H, Mücke H G, Anpassung an die gesundheitlichen Risiken des Klimawandels als Aufgabe des umweltbezogenen Gesundheitsschutzes. Analyse einer bundesweiten Recherche und Erhebung des Umweltbundesamtes.

low ozone events²⁵, which can be recorded in the northern hemisphere – also in Germany - at late March/early April. The thinner atmospheric ozone layer causes an increase in UV irradiance. This leads to an unexpectedly high UV exposure that is unusual for that time of year.

The fact that alongside the negative effects, UV radiation also has a positive health effect with the Vitamin D synthesis, forces to a differentiated and informed handling of UV radiation. The principles that apply to this are summarized in a recommendation that was worked out under the direction of the Federal Office for Radiation Protection (BfS) and in cooperation with the UV Protection Alliance, and is supported by a total of 20 authorities and organizations (www.bfs.de/vitamin-d). The basic message is that no extensive UV exposure is necessary for a sufficient Vitamin D synthesis, and that a sunburn is absolutely to be avoided. Especially children have to be protected. And, a physician should treat a medically diagnosed Vitamin D deficiency. This recommendation is in agreement with internationally recognized scientific evidence²⁶. Since decades, behavioural prevention measures, such as information campaigns, educating or working with children and young people, are performed to prevent the health consequences of too high UV exposure. For an effective, comprehensive approach, however, additional structural prevention measures in addition to behavioural prevention measures are required. These aim to design living and working environments in such a way that timely protection against excessive UV exposure is also possible due to external conditions such as shading, work process optimization and display of current UV exposure (UV Index). In some cases, approaches are already visible in Germany – for a holistic approach to reduce UV-related diseases, however, the nationwide establishment of structural prevention measures is urgently required.

[Adapting to the health risks of climate change as a task of environment-related health protection. Analysis of nationwide research and surveying by the Federal Environment Agency.] Federal Health Gazette 2014. DOI 10.1007/s00103-014-2056-7.

²⁵ World Meteorological Organization (WMO), Scientific Assessment of Ozone Depletion: 2014, World Meteorological Organization, Global Ozone Research and Monitoring Project—Report No. 55, 416 pp., Geneva, Switzerland, 2014.

²⁶ IOM, Dietary Reference Intakes for Calcium and Vitamin D. 2011.

Webb, A.R., R. Kift, M.T. Durkin, S.J. O'Brien, A. Vail, J.L. Berry, L.E. Rhodes. The role of sunlight exposure in determining the vitamin D status of the UK white Caucasian adult population. *Br J Dermatology*. 2010; 163: 1050-1055. eScholarID <https://www.escholar.manchester.ac.uk/uk-ac-man-scw:143681> | DOI:10.1111/j.1365-2133.2010.09975.x. (Access on 20 April 2018)

4th Edition of the European Code of Cancer; <http://cancer-code-europe.iarc.fr/index.php/en/> (Access on 20 April 2018).

Objectives

The overarching objective is to increase the quality of life in Germany by reducing excessive UV exposure with nationwide establishment of structural prevention measures where people – and especially children – are subjected to this environmental influence in their living environments (see footnote 6)²⁷. This objective is in line with international and national recommendations on skin cancer prevention, including the German Commission on Radiological Protection (SSK)²⁸ and the World Health Organisation (WHO)²⁹, as well as with the guidelines for the implementation of the National Cancer Plan, treatment fields 1 and 4³⁰. The following interim targets serve this purpose:

- **Political establishment:**
 - Supplementing the existing health objectives "Healthy growing up" and "Healthy aging" mentioned in the Preventive Healthcare Act (Article 20, Para. 3, No. 4 and 7, PräVG) with the sub-goal "Reducing of the morbidity and mortality of UV-related diseases, especially of skin cancer".
 - Inclusion of structural prevention measures in the sense of this paper as a field of action in the implementation of the national prevention strategy (see Article 20d, Para. 2, No. 1, PräVG).
- **Securing the funding:**
 - Inclusion into health policy programs (general population and occupational safety) at federal and state political level as well as at local authority level.
 - Creation of sustainable funding programs and guidelines for structural prevention measures at federal and state level.
- **Practical implementation**
 - Inclusion of structural prevention measures into local authority agendas to reduce UV exposure outdoors.
 - Development of holistic, sustainable concepts to establish structural prevention measures for reducing outdoor UV exposure in cities, rural areas and communities, including sports venues, events venues and other public facilities, and with consideration for occupational health and safety.
 - Incorporation of structural prevention measures to reduce outdoor UV exposure into integrated local and regional development concepts.
 - Visualisation of the erythemal UV irradiance in public.

²⁷ This paper deals primarily with solar UV radiation. It must be noted however that the use of artificially generated UV radiation in sunbeds can lead to considerable health damage. Regulation of sunbed use and/or a prohibition of their use must therefore be considered as an environmental prevention measure.

²⁸ SSK (2016) Recommendation "Protection of man against the hazards of solar UV radiation and UV radiation in solaria". https://www.ssk.de/SharedDocs/Beratungsergebnisse_E/2016/2016-02-11%20Empf_UV-Schutz_KTe.html?nn=2876334 (Access 20 April 2018).

²⁹ WHO (2002) Sun Protection: An Essential Element of Health-Promoting Schools. Information series on school health (document 7). World Health Organization, Geneva. http://www.who.int/school_youth_health/media/en/456.pdf?ua=1 (Access 20 April 2018).

WHO (2003) Sun Protection and Schools-How to Make a Difference. World Health Organization, Geneva <http://www.who.int/uv/publications/en/sunprotschools.pdf?ua=1> (Access 14 March 2017).

³⁰ Federal Ministry for Health (BMG). National Cancer Plan. <http://www.bmg.bund.de/themen/praevention/nationaler-krebsplan/handlungsfelder.html> (Access 20 April 2018).

- **Sustainable competence generation and preservation:**
(Cross-sectional task of different training institutions of different occupational profiles)
 - Inclusion of the topic “Behavioural/Structural prevention of skin cancer” in curricula for schools, universities and professional trainings as well as further education and training in the following occupational profiles:
 - Medicine (general medicine, dermatology, paediatrics and adolescent medicine, ophthalmology, medical specialist for the public health system, including the respective assistant professions),
 - Pharmacy,
 - Cosmetics,
 - Ophthalmic optics / Optometry,
 - Child-rearing and childcare,
 - Teaching post (all school types),
 - Occupational health and safety (safety engineering, medical specialists for occupational medicine, occupational safety specialists),
 - Architecture and urban planning,
 - Landscape architecture, landscaping,
 - Construction professions and
 - Business administration (environmental management, company policy, company ethics).
 - Integration of the topic “behavioural/structural prevention of skin cancer” in the teaching and care curricula for schools and day care centres.
 - Sensitization of parents regarding the application of behavioural/structural prevention measures, for example by means of informing parents via paediatricians during preventive examinations for children (in Germany already fixed in the so-called U5 examination) and via day care centres and schools.

Measures

Structural prevention measures to avoid excessive UV exposure from sunlight are easy to implement. These include simple things like the establishment of UV-reducing shaded areas, for example by planting vegetation or putting up suitable awnings. Once installed, measures like these are easily accepted. For example, there is clear evidence for the acceptance of shaded areas by children and young people, who are otherwise difficult to reach through behavioural prevention measures.³¹ This installation of shaded areas in day care centres, kindergartens and schools has been awarded highest priority in the oncological S3 guideline 'Prevention of skin cancer'³².

Structural prevention also means that daily procedures and/or the organisation of work in the living environments are organised in such a way that exposure to UV radiation can be avoided. Here, it is important to know the strength of sunburn-inducing UV irradiation. An appropriate measure is to report regularly about the UV-Index (see for example www.bfs.de/uv-index.de and https://kunden.dwd.de/uvi_de), and display it publicly.

Some of these measures, such as the creation of effective shaded areas, can serve simultaneously to prevent health-damaging outdoor heat exposure³³. In this way, a further eco-political and health important topic can actively addressed with one measure.

In order to sustainably establish the topic "prevention of UV-related diseases, especially skin cancer", a further important milestone is to anchor the topic "UV effects and UV protection" in schools, apprenticeship and occupation by enhancing and adapting curricula at educational, training and teaching level.

In Germany, structural prevention measures are already applied selectively. The next step now is towards the comprehensive, equilateral and sustainable application of structural prevention measures. For this purpose, first, superordinate structures or action requirements have to be created, such as the anchoring of structural prevention measures in legal regulations as well as creation of funding opportunities and of generally valid training requirements. Based on this, concrete measures can then be implemented on site.

The following measures have to be taken:

³¹ Dobbins et al (2009) Adolescents' use of purpose built shade in secondary schools: cluster randomised controlled trial BMJ 338(feb17 1): p. b95-b95.

³² Oncology guidelines program (German Cancer Society, German Cancer Aid, AWMF): S3-Leitlinie Prävention von Hautkrebs [S3 Guideline Prevention of Skin Cancer], long version 1.0, 2014, AWMF registration number: 032/052OL, <http://leitlinienprogramm-onkologie.de/Hautkrebs-Praevention.56.0.html> (Access on 20 April 2018)

³³ Matzarakis, A., 2013: Stadtklima vor dem Hintergrund des Klimawandels [The urban climate against a background of climate change]. Gefahrstoffe – Reinhaltung der Luft [Hazardous material – Maintaining air quality] 73, 115-118.

- **Federal/state level – Political and programmatic anchoring**

- Political and programmatic anchoring:

The Federal Government and state governments check how comprehensively effective structural prevention measures can be anchored politically and programmatically to prevent UV-related diseases, in particular skin cancer. For this, the legal preconditions are given by:

- the “Preventive Healthcare Act,”
- the “Early Detection and Registration of Cancer Act – KFRG”
- supplemented by a statutory obligation under the Town and Country Planning Code (Article 1, Para. 6, No. 1 and 7c; Consideration of the general requirements for healthy living and working conditions and the environmental effects on humans and their health).

- Securing the funding

The Federal Government and the federal states include structural prevention measures outdoors and in people’s living environments to prevent UV-related diseases, in particular skin cancer. For example within the framework of the Health & Social funding area (Funding database – Funding programmes and financial support from the Federal Government, the states and the EU³⁴ and the Federal Ministry for the Economy and Energy) or in the funding period for national urban construction projects (Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety)³⁵.

- **Local authority level – Planning and practical implementation:**

- Exploring interfaces and docking points for structural prevention measures

In (planning) processes for urban construction, town and buildings planning, as well as in the planning of outdoor workplaces interfaces and docking points for structural prevention measures to reduce the UV exposure outdoors and in the outdoor areas of public facilities and facilities under the responsibility of third parties are determined, listed and established as a basis for further action. In terms of integrated urban development, area-related activities to reduce of health-related UV exposure are embedded in a territorial development policy.

- Structural prevention measures in the planning of buildings

Concrete measures to reduce health-related UV exposure outdoors and in the outdoor spaces of public facilities, especially in kindergartens, day care centres, schools, sports and leisure facilities, are adopted and implemented in the planning of new buildings and renovation of existing outdoor facilities and buildings as well as in the planning of urban construction, city and building planning.

³⁴ <http://www.foerderdatenbank.de/Foerder-DB/Navigation/root.html> (Access 20 April 2018).

³⁵ <http://www.bmu.de/themen/stadt-wohnen/staedtebau-foerderung/bundesprogramme-nationale-projekte/> (Access 20 April 2018).

- Visualisation of UV irradiance as the UV Index
Central locations at which sunburn-inducing UV irradiance should be visualised with the UV Index (e.g. outdoor pools, bathing sites at rivers and lakes, tourist information, inner-city grounds etc.), are listed for each municipality and UV Index displays installed. Municipalities can find support for example at the Federal Office for Radiation Protection (BfS) and the German Meteorological Service (DWD).
- **Research and development**
 - Visualisation of UV and heat exposure in microscale spaces
Modelling programs that visualise the possible UV exposure of people in certain small- (micro-) scale urban planning and landscaping situations are further developed to optimise environmentally oriented construction and landscape planning. These programs and tools should also visualise the heat exposure in these situations, as well as the change in the individual UV and heat exposures due to protection measures. The modelling programs should be integrated in or compatible with geographic information system (GIS) based programs.
 - Visualisation of UV irradiance as the UV Index
Already available systems for measuring the sunburn effective UV irradiance and for displaying it as UV-Index are listed and evaluated in terms of their suitability for use in public. In addition, available display systems are listed and evaluated regarding their ability to visualise the UV Index outdoors. If required, more cost-effective variants of these displays are developed for the broad application, which help to measure the current sunburn effective UV irradiance and to display this clearly visible and readable as UV Index.
 - Development of a database of concrete measures and recommendations
A database will be developed to record and manage concrete structural prevention measures with a detailed description of the application options and their implementation in areas such as construction, landscaping or textile shading options. Similarly, there should be listed realizable recommendations for the design of daily routines in living environments (day care, schools, etc.), with which a reduction of the UV exposure outdoors and in outdoor facilities can be achieved. The database should be designed in such a way that authorities at federal and state level, local authorities, registered stakeholders as well as interested parties can work with it. The database is not a database of and for product suppliers but will be designed exclusively for the interactive exchange of information between the registered participants. With the help of advanced search options, it should be possible to find suitable measures for specific situations and suitable contacts.

- **Education:**

- Creation of a catalogue of basic principles for teaching and training plans

A catalogue of basic principles for the preparation of teaching and training plans (curricula) is created for imparting specialist knowledge about the health effects of UV radiation and the prevention measures derivable from this with the focus on structural prevention measures.

- Elaboration of curricula

Curricula are prepared target-group-specifically for different job profiles which has to be addressed³⁶ and for groups of people who are either decision makers³⁷, who advise decision makers³⁸ or those who ensure the responsible use of structural prevention measures³⁹. Protection measures against the health effects of high heat exposure are addressed in these curricula. This will enable an informed and participative decision making process for each individual in terms of preventive measures.

- **Mass Media**

The regional by the federal authorities determined or in cooperation received sunburn effective UV irradiances as well as their daily progression expressed as UV Index values are made available to the media and concretely adapted to their needs. The objective is the visualisation and discussion of the UV Index in weather reports, online services and apps on an equal footing with the display of temperature, wind and precipitation.

³⁶ see Chapter "Objectives / Sustainable competence generation and preservation

³⁷ decision makers at federal government, federal state and city level, employers, bearers for public facilities and sports facilities

³⁸ for example occupational physicians, safety engineers and specialists in occupational safety

³⁹ coaches, teaching and childcare staff

Addressees of measures

This list of addresses for the measures described above is exemplary (shortened compared to the German list):

- Ministries at federal level responsible for affairs of health, environment, family, labor and social affairs, economic affairs and energy
- Ministries at federal state level and local authorities responsible for affairs of health, environment, consumer protection, labor, sport, schools and/or nurseries
- Medical and Social insurances, associations, federations, agencies and services (health, accident, statutory pension)
- Cooperation for the development of national health targets / issues
- Patients and consumer mandatories
- Local authority representatives (cities and municipalities)
- Entities responsible for public institutions (schools, kindergartens, sports venues)
- Tourist and hotel institutions
- Social partner (Employer unions, Trade Union Confederations)
- Education coordinating organisations
- Regulatory institutions (institutions issuing standards, consumer councils)
- Meteorological editorial departments / services, mass media

Impact

The measures listed here will generate effects in urban and rural areas to ensure a healthier lifestyle for all by:

- Lowering the risk of UV-related diseases, in particular skin cancer, by reducing UV exposure outdoors.
- Lowering the risk of heat-related diseases by reducing heat exposure outdoors.
- Lowering the costs for the health care sector and the burden on general wellbeing.
- Improving working conditions for outdoor workers and with this, lowering the costs for occupational UV-induced diseases.
- Increasing the general quality of life, in particular the quality of life of children in daycare settings (nurseries, kindergartens, and after-school clubs) and schools.
- Increasing the attractiveness of cities and municipalities, public areas, local recreation areas, bathing beaches and swimming pools due to reduced UV and heat exposure for both residents and visitors (tourists)
- Increasing the well-being

Partner



- ✦ [Arbeitsgemeinschaft Dermatologische Onkologie \(ADO\)](#)
- ✦ [Arbeitsgemeinschaft Dermatologische Prävention e.V. \(ADP\)](#)
- ✦ [Berufsverband der Deutschen Dermatologen e.V. \(BVDD\)](#)
- ✦ [Bundesamt für Strahlenschutz](#)
- ✦ [Bundesanstalt für Arbeitsschutz und Arbeitsmedizin \(BAuA\)](#)
- ✦ [Bundeszentrale für gesundheitliche Aufklärung](#)
- ✦ [Deutsche Dermatologische Gesellschaft \(DDG\)](#)
- ✦ [Deutsche Gesellschaft für Kinder- und Jugendmedizin e.V. \(DGKJ\)](#)
- ✦ [Deutsche Gesetzliche Unfallversicherung e.V. \(DGUV\)](#)
- ✦ [Deutsche Krebsgesellschaft \(DKG\)](#)
- ✦ [Deutsche Ophthalmologische Gesellschaft \(DOG\)](#)
- ✦ [Deutscher Hausärzteverband e.V.](#)
- ✦ [Deutscher Wetterdienst \(DWD\)](#)
- ✦ [Deutsches Krebsforschungszentrum \(DKFZ\)](#)
- ✦ [European Skin Cancer Foundation \(ESCF\)](#)
- ✦ [European Society of Skin Cancer Prevention \(EUROSKIN\)](#)
- ✦ [Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V. \(GEKID\)](#)
- ✦ [Stiftung Deutsche Krebshilfe \(DKH\)](#)
- ✦ [Verband deutscher Betriebs- und Werksärzte e. V. \(VDBW\)](#)
- ✦ [Zentralverband der Augenoptiker und Optometristen \(ZVA\)](#)

Planned partner:

All authorities, institutions, organizations and associations participating in this process.

Contact

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