pinfa
Phosphorus, Inorganic & Nitrogen Flame Retardants Association

Your newsletter for
non-halogen fire safety solutions

Special – Sustainable Fire Safety - n° 141 – September 2022

SAFE AND SUSTAINABLE BY DESIGN (SSBD) FLAME RETARDANTS

100 to 130 participants joined the three sessions of pinfa's webinar on "What are Safe and Sustainable Flame Retardants?" (one hour sessions on each of 27, 28 and 30th June 2022). Leading NGOs, experts and downstream users (TCO, ChemForward, ChemSec, Google, Schneider Electric, Peter Fisk) underlined the need to move faster towards sustainable and safe flame retardants, with chemical data and recognised chemical assessment schemes seen as essential to achieve this. The PIN flame retardant industry, and European chemical industry (Cefic), identify this as an opportunity, to move towards "safe and sustainable flame retardants", and welcomes the EU Green Deal initiatives on sustainable chemicals, recycling and sustainable products. pinfa and its member companies underlined the importance of working with downstream users and the necessity for FRs to be durable, to enable prolonged product lifetimes and recycling.

Watch the webinars now on pinfa's YouTube channel
https://www.youtube.com/channel/UChb0kX3QSJdcYs1Qjjz0HAw
Download presentation slides here:
https://www.pinfa.eu/presentation/what-are-safe-and-sustainable-flame-retardants/

Filipe Almeida, Cefic (the European Chemical Industry Federation)

underlined that the Green Deal Chemicals Strategy for Sustainability represents a radical step forward in regulation, with important changes in both REACH and CLP (Classification, Labelling and Packaging) within wider actions such as the Sustainable Products Initiative and Ecodesign. Expected major changes include new Hazard classes for chemicals, extension of Classification to mixtures, obligation to REACH Register certain polymers and to declare all polymers, and fast-track generic restrictions of whole families or classes of chemicals. Cefic estimates that some 12 000 chemicals, representing over 40% of the EU chemical industry's turnover, are potentially concerned by currently proposed generic restrictions. One such generic group proposed covers all flame retardants (see EU "chemicals restrictions roadmap" in pinfa Newsletter n°138).

Adrian Beard (Clariant), Chairman of pinfa

emphasised that this proposed generic category "flame retardants" is not logical, because it refers to a function and not a family of chemicals. In fact, flame retardants face the same challenges as other plastic additives, in particular ensuring durability (enabling product longevity and recycling). He underlined that EU Ecodesign is proposing a new category of "Substances of Concern" which could include any substance which impedes recycling (see Newsletter n°138). pinfa sees the Green Deal Chemicals Strategy for Sustainability as opening opportunities for safer PIN flame retardants, taking into account environmental footprint, social value of performance in use (fire safety) and recyclability. To achieve this, data sharing with downstream user industries is essential, as is enforcement by regulatory authorities, including for chemicals in imported products.

Laurent Tribut, Schneider Electric (pinfa member)

explained that ensuring 50% "green materials" in its products by 2025 is a core element of the company's sustainability objectives, including both climate and resources, and covering both Schneider Electric and its suppliers. Nearly all materials used need flame retardants to ensure fire safety. This has led to an internal definition of a "green plastic" as either 20% recycled/bio-based and halogen-free, or using only "green FRs", or 50% recycled/bio-based if halogenated. "Green FRs" are defined by the company as non-halogenated and GreenScreen 3 or 4, in order to avoid possibly becoming a regulatory obstacle to future recycling. This is more demanding than the TCO list (22 PIN FRs, see pinfa Newsletter n°136) and limits so far to the PIN FRs: APP, MDH, Depal (phosphinate) and specific phosphites. Schneider Electric considers that ecodesign and sustainable chemicals requires the development of a recognised global assessment method for FRs (current existence of several systems causes confusion), more precise downstream communication on FRs (ISO 1043-4 is too general, see pinfa Newsletter n° 129), development of processes to recover and recycling FRs in pyrolysis or solvent chemical recycling, and a move towards using only one FR without synergists (to facilitate recycling).

Barton Finn, TCO Development

presented TCO Certified, the global independent sustainability certification addressing social and environmental responsibility of workplace and data centre related IT products. TCO Development considers that "negative/restrictive lists" have proven to be ineffective in driving the transition to safer chemicals, because only a very small number of chemicals are properly assessed/banned and because substitutes with potentially similar or even worse impacts for human health and the environment are able to be used as the replacement. **TCO therefore launched in 2015 the TCO Certified Accepted Substance list (ASL), a public "positive list" of safer alternative flame retardants which today includes 22 PIN FRs** (see pinfa Newsletter n°136). This means that all potential alternatives to restricted substances and banned until they are independently proven to be safer and placed on the ASL. Presently half of these listed FRs have achieved a GreenScreen benchmark 3 and half a GreenScreen benchmark 2. TCO Certified does not accept GS benchmark 1 or U (unspecified). A manufacturer wishing to obtain TCO Certified must use only chemicals shown on the ASL. In the current generation of TCO Certified, for flame retardants, this concerns product plastic housing parts > 0.5 g and the main power printed circuit board (PCB). However, for the next generation in 2024, it is under consideration to extend this FR mandate to include power cables and all PCBs in the product. The ASL also covers safer alternative plasticisers used in all product wires & cables and plastic parts, and cleaning solvents used during the manufacturing of the product. TCO uses the CEPN (Green America Center for Sustainability Solutions) chemical data collection tool to monitor chemicals used in IT production factories. GreenScreen assessments are paid by those suppliers with the greatest interest in seeing a chemical added to the ASL so they may continue to use it in products and during production. The list is made public to share information and provide guidance to use the available safer alternatives and avoid the regrettable substitution caused by restricted substance lists.

Jonatan Kleimark, ChemSec

indicated that the International Chemical Secretariat is an independent non-profit organisation, founded in 2002, to advocate for substitution of toxic chemicals to safer alternatives, funded by the Swedish Government, WWF and other NGOs and individuals. ChemSec's tools to drive political discussion and business change include the SinList (Substitute it Now), which identifies around one thousand potentially problematic chemicals, and MarketPlace, which enables companies to promote safer alternatives (see pinfa Newsletter n°119). **ChemSec considers that chemicals with no health or environmental Hazard are the only way to ensure zero risk, from production, through use to end-of-life**. ChemSec underlines the Green Deal Chemicals Strategy for Sustainability objective to widen REACH and regulatory chemicals assessment to include environmental footprint and sustainability, and considers that as a first step "minimum thresholds" should be defined for greenhouse emissions, water use, wastes from production, ecosystem and biodiversity impacts and basic social criteria, with further variables to be added progressively.

Peter Fisk, Green Chemical Design

presented a study underway for pinfa, looking at whether organo-phosphorus flame retardants (OPFRs) is a meaningful group of chemicals for generic legislation, or how they could be appropriately grouped. He underlined that the REACH dossiers for OPFRs are data rich: studies are available for most required end-points and read-across is little used. Analysis of the REACH data shows that grouping of all PIN OPFRs is very inappropriate, because they show highly variable chemical properties and very different toxicity effects. Ecotoxicity is largely related to K_{OW} (octanol-water partition coefficient, indicative of whether the chemical tends to be water or lipid soluble). Assessment showed that Hansen Solubility Paraments (HSP) for dispersion and polarity varied widely between OPFRs, and that 6 'clusters' of different OPFRs could be identified by these parameters. This possible grouping generally seemed to correspond to ecotox and tox properties, except for the trialyklphosphate esters where only one substance shows carcinogenicity. Therefore, it is necessary to check whether to exempt certain products or subdivide structural groups further before considering regulatory measures on a (sub-)group.

Stacy Glass and Lauren Heine, ChemFORWARD

underlined the need to establish trusted downstream user information on chemicals in products. Firstly, toxicology data is missing on many chemicals. Secondly, data is not accessible to users. A survey of nearly fifty retailers and OEMs showed that they consider chemical hazard data to be essential for decision making but that the current system data is not harmonised, not peer-reviewed and not portable. They also noted an abundance of data on hazardous chemicals but a lack of data on safer alternatives. ChemFORWARD has therefore established a globally harmonized repository of chemical hazard data that is peer reviewed and subject to continuous improvement. The data sharing model makes the information cost-effective and widely accessible. The organisation has also developed the "SAFER" chemical information system, aiming to provide one

inclusive profile for each chemical, linked to chemical trade names and including co-ingredients, and covering GHS Hazard classifications and available data. The profiles are validated by consultants and open to public challenge. The A to F rating enables equivalence to scores from other schemes: EPA SCIL (Safer Chemicals Ingredients List), GreenScreen, and Cradle-to-Cradle Certified. Raw materials with the SAFER designation are available on ChemFORWARD's website and via B2B sites such as ChemSec's MarketPlace.

Mike Werner, Google

Google is committed to moving to safer chemicals in its products and operations to support a safe and circular economy, from production through the end of life for recycling. For Google, this means using less hazardous chemicals. To achieve this, a widely accessible data platform on chemical hazard assessments is essential, so that suppliers can take action and begin using lower hazard chemicals in their materials. The ChemFORWARD SAFER platform enables this by providing data on low hazard chemicals.

Google recognises the importance of flame retardants to ensure the safety of electronics products and systems. Google has already moved away from halogenated flame retardants as a class because of regulatory, customer, and market requirements, as well as their lifecycle health concerns (e.g., persistence, bioaccumulation potential and toxicity).

Carles Ibanez, ICL (pinfa member)

discussed the challenge for flame retardants and for all plastics additives of persistence versus durability. Flame retardants must be chemically stable, that is "durable", both in processing (e.g. melting of plastic compounds and injection molding or extrusion), and throughout the whole product lifetime and to enable recycling. For flame retardants in building materials, this means ensuring fire safety over decades. But this means that flame retardants must be "persistent" chemicals. To ensure safety, flame retardants must therefore show no health or environmental impact and should not leach out of products during lifetime. Also, appropriate handling is necessary in processing and during product end-of-life management, to avoid exposure or losses.

Thomas Futterer, Budenheim (pinfa member)

A very wide range of different flame retardants are today needed to achieve fire safety in materials with very different and demanding mechanical, electrical, aesthetic or other properties. This makes end-of-life recycling complex. Different recycling routes are being developed: mechanical recycling, for which the key is sorting of input plastics, chemical (pyrolysis) and solvent-based. Research into fate of PIN FRs in different recycling routes is still at an early stage. Several studies show that PIN FRs can be compatible with mechanical recycling, because they are durable and so compatible with several ageing in product, re-melting compounding, reprocessing cycles. Some data shows that PIN FRs can be compatible with chemical recycling. More research is needed into possible recovery for reuse of PIN FRs in such processes. pinfa is currently assessing where research is needed, and is interested in contacts with projects looking at PIN FRs in recycling.

SUSTAINABILITY & FIRE SAFETY: WHAT'S THE LINK?

As part of EU Green Week, Fire Safe Europe's 2nd June 2022 webinar discussed why fire safety is linked to sustainability in buildings, in the context of the EU's "Renovation Wave" objective of renovating building stock to improve energy efficieny and of "green buildings".

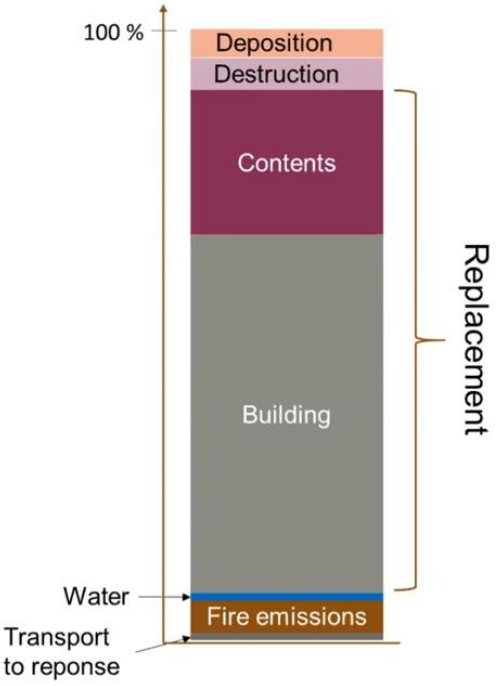
Watch the webinar here https://firesafeeurope.eu/webinar-sustainability-fire-safety-whats-the-link-the-replay-is-now-available/ Agenda and speakers list here https://firesafeeurope.eu/wp-content/uploads/2022/05/Agenda_EUGreenWeekFSEU_FINAL-1.pdf

Margaret Simonson McNamee, Lund University,

Introduced the webinar with a presentation explaining why environmental and Life Cycle Analysis (LCA) assessments of buildings should take into account fire risk and fire safety, in the context of the IAFSS agenda for fire safety (International Association for Fire Safety Science, see pinfa Newsletter n°108). This agenda identifies two sets of global challenges for fire safety: population growth - urbanisation - globalisation and climate change – resilience – sustainability. Unintended fires have important environmental consequences, both local (smoke and soot, polluted extinction waters, etc.) and global (impacts of response, replacement of damaged buildings and contents, site remediation, etc.).

Recent work on estimating the environmental impact of response to fires (the Fire Impact Tool project) indicates that the vast majority of the global environmental impact of house fires is related to replacement of the structure and contents (see graphic below). The work was led by Dr Francine Amon of RISE with participation from Dr McNamee amongst others.

To establish a full understanding of the impact fire has on sustainability, LCA should also consider the social impacts of fires (e.g. loss of homes and income, psychological impact etc) and its economic costs (e.g. deaths and injuries,



property value, losses to businesses and other resulting costs). In the future there is a hope that these aspects can also be included in the model.

Finally, Dr McNamee presented a methodology for creating a sustainable and fire resilient built environment (SAFR-BE) by designing buildings to meet sustainability and fire resiliency objectives in synergy rather than in potential conflict, and noted that this approach can ensure that fire safety and sustainability are enablers for innovation.

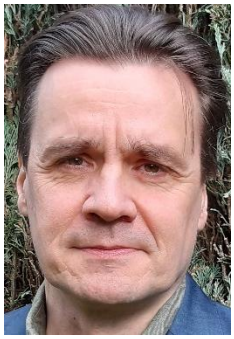
References:

"IAFSS agenda 2030 for a fire safe world", M. McNamee et al., Fire Safety Journal 110 (2019) 102889
https://doi.org/10.1016/j.firesaf.2019.102889

"Fire Impact Tool – Measuring the impact of fire suppression operations on the environment", F. Amon, J. Gehandler, R. McNamee, M. McNamee and A. Vilic, Fire Safety Journal, 120 (2020), https://doi.org/10.1016/j.firesaf.2020.103071.

"Sustainable and Fire Resilient Built Environment (SAFR-BE)". Meacham, B.J., McNamee, M. (2023). In: Meacham, B.J., McNamee, M. (eds) Handbook of Fire and the Environment. The Society of Fire Protection Engineers Series. Springer, Cham. https://doi.org/10.1007/978-3-030-94356-1_13

Heikki Väänänen, European Commission DG GROW



The EU FIEP (Fire Information Exchange Platform) was launched with the aim of improving fire safety across the EU by sharing information on best practices between Member States. The EU's Fire Statistics Project (EU FireStat, final report to be published soon) has collected information on what fire statistics exist in Member States, and what are their needs to support improving fire safety. The aim is to identify a number of key statistics as indicators and to then encourage Member States to progressively implement and harmonise these. These indicators will not directly address sustainability. FIEP could address the question of integrating sustainability and fire safety.

Fulvia Raffaelli, European Commission DG GROW

Emphasised that sustainability is critical in construction, but is also very complex. Energy efficiency was a key parameter in the past, but now circularity is also a priority (use of secondary materials, recycling building materials on demolition). Sustainability is integrated into the proposed revision of the CPR (Construction Products Regulation), alongside fire safety which was already a key CPR parameter for building materials and is fully maintained. Fire safety is a very important element in both new construction and building renovation and is included into both the EPBD (Energy Performance in Buildings Directive) and the EU Renovation Wave. Data is essential to support these policies, as are testing and standards.

Fire safety is a very important element of overall "quality" of buildings, and fire safety, sustainability and performance must be integrated. Innovation is needed in new materials combining low climate and environmental impacts and high fire performance.

Christian Fundby Schou, DBI

Agreed that fire safety opens important potential for innovation in sustainable building materials and construction. This is possible if fire safety is integrated from initial conception. Both materials and buildings should be Fire Safe and Sustainable by Design. Circularity poses specific challenges, with the need to ensure fire safety of bio-based and secondary materials, including with ageing during the buildings service life.

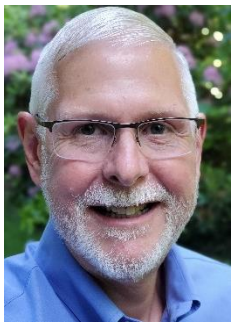
SBI is the Danish Institute of Fire and Security

Grunde Jomaas, FRISSBE and ZAG

There is a need for science, testing and standards, both on new materials and new energy systems in green buildings, and on the links between fire safety and sustainability. Fire safety tends to be evaluated as "lives saved" and this does not convert to climate or environmental impacts, so new data is needed on sustainability benefits of fire safety.

FRISSBE (Fire-safe Sustainable Built Environment) is an EU-funded project at ZAG (Slovenian National Building and Civil Engineering Institute)

Brian Meacham, Meacham Associates



Further underlined the need for data on changing fire risks with green buildings. Data is not keeping up with the implementation of new technologies, green materials, façade insulation, photovoltaics, energy storage, etc. Developments in green buildings need to take into account the links between regulations on fire safety for materials, energy systems and buildings.

Mr Meacham and other panellists emphasised the need for training and support to engineers and throughout the construction design and implementation chain, on the new fire risks related to new green materials and building techniques, and on the integration of fire safety and sustainability.

Yosr Melki, Knauf Insulation

Keeping people safe is critical for all buildings. She calls for wide value chain cooperation to integrate sustainable construction and fire safety, engaging design engineers and architects, materials suppliers, the construction industry, as well as researchers and regulators

Fanny Guay, PAROC

Industry wants European standards, to facilitate placing on the market and to ensure demanding levels of fire safety. The EU has regulatory tools which can support this, in particular the Construction Products Directive and the Energy Performance in Buildings Directive, but in the latter fire safety is only included marginally. The EU should also adopt a European Fire Safety Strategy. This cannot oblige Member States, but could have a very important role in influencing national policies and providing guidelines, and in orientating EU policies and funding tools.

PUBLISHED PAPERS AND REPORTS

Research gaps for integrating fires into LCA

A Fire Safety Journal article and a thesis from Oregon State University find little existing science and identifies research and data gaps. Of nearly 100 publications identified, most concern research methodology, pollutions following exceptional fire events or general construction earthquake – fire resilience, and only very few address building fire statistics (e.g. Lin 2005), general environmental impact of fires (Martin 2016 – see below, Fischer & Varma 2016) or integration of accidental fires into Life Cycle Analysis (Hamzi 2008, Chettouh 2014, 6 papers by McNamee Simonson, Andersson, Marlaiir et al. 1999, 2004, 2004, 2005, 2006, 2015).

Few of the publications identified are recent. A Delphi process was then implemented to identify and prioritise research gaps, involving ten experts (consultants, science and research).

The main research priorities identified were the need for more statistical data on number and severity of fires, fire origin and extent of fire spread in different buildings, and data on contamination of air, water and soil resulting from fires.

"Identifying and prioritizing research gaps for the incorporation of fires in life cycle analysis of structures: A Delphi survey of international experts", MSc thesis T. Thorp, University of Oregon, 10th May 2021
https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/6q182t340

"A Delphi study to identify and prioritize research gaps for the incorporation of a fire into life cycle assessment of structures", Fire Safety Journal 129 (2022) 103571
https://doi.org/10.1016/j.firesaf.2022.103571

Data on environmental emissions from fires

New report analyses emissions from fires, susceptible to have health or environmental impacts, with an Emission Factor database for 90 materials. The US NFPA Fire Protection Research Foundation (FPRF) report, and downloadable Excel data base (see links below) follows the Research Roadmap "Environmental impact of fires in the built environment" (2020), see pinfa Newsletter n°118. It notes that most available data covers only CO and CO2 emissions, and not organic species (such as PAH polyaromatic hydrocarbons, dioxins or soot particles), despite these probably represent the largest environmental impact and decontamination costs.

The report draws on a recent INERIS (France) study characterising toxic substances (long-term or acute toxicity) emitted by fires and on large and small scale fire tests carried out at INERIS and at Lund University 2019-2020, as well as existing test data from literature (13 publications identified in table 5 for which experimental data was available). Results of 32 room tests are included, of which, in 18 only minimum emissions were measured (CO_2, CO, acid gases, HCN): in 14 also metal particles, soot particles, PAH, PCDD/F and PBDD/F were measured. These tests covered a range of products (car, lithium ion battery cells, crushed electronics materials, fridge, cotton or synthetic clothes …) and single materials (oil, polyethylene, PVC, different woods …).

Flame retardants were presumably not present in the single materials, and the presence or not in the products is not specified. The report notes good correlation between emissions from small and large scale tests, but that tests were largely well-ventilated (emissions in poorly-ventilated fires need to be investigated). Also, further investigation should look at whether emissions from fires involving various different materials as fuels are simply the sum of emissions from each material separately.

"Environmental Impact of Fires in the Built Environment" includes link to downloadable Excel data base, US NFPA (National Fire Protection Association) https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/The-environmental-impact-of-fire

"New report released on the environmental impact of fire internationalfireandsafetyjournal.com", IFSJ (International Fire Safety Journal); 21 July https://internationalfireandsafetyjournal.com/new-report-released-on-the-environmental-impact-of-fire/

"Environmental Impact of Fires in the Built Environment: Emission Factors", M. McNamee, J. Åström, B. Truchot, G. Marlair, B. Meacham, Fire Protection Research Foundation, April 2022 https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/The-environmental-impact-of-fire

"Recensement des substances toxiques (ayant un impact potentiel à court, moyen et long terme) susceptibles d'être émises par un incendie", INERIS - 203887 - 2079442 - v2.0 https://aida.ineris.fr/guides/emissions-incendie

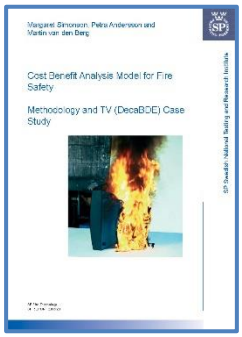
Review of environmental impacts of fires

NFPA-funded study proposes framework for quantifying environmental impact of fires and identifies research gaps. As above, most of the c. 60 references concern environmental impacts of wildfires or of major fire incidents, fire statistics reports or ISO methodologies. Several cited papers are analysed in the Supplementary Information, in particular comparative environmental impact analysis of fires with/without automatic sprinklers (FM Global: Gritzo 2011, Wieczorek 2010) and of warehouse sprinklers (Fraser-Mitchell 2013) and Source: ISO 26367-2: Guidelines for Assessing the Adverse Environmental Impact of Fire Effluents Part 2: Methodology for compiling environmentally significant emissions from fires. Also as above, several McNamee-Simonson et al. papers are cited which propose a guidance framework for fire-LCA and present fire-LCA studies on TVs, cables and furniture, (in additional to those indicated in the article above: 2001, 2004) which proposes a guidance framework for fire-LCA. The study concludes that significant information is available concerning environmental impacts of fires, but it is not complete and means are not available for its use in decision making. Environmental impacts of building fires are very different from wildfires. Research gaps are identified: data of environmental impact for smaller fires (most data comes a few major fire incidents), data on impacts of burning building contents, impacts of flame retardants in burned materials, data from countries other than the USA, tools to include fire impacts in EIA (Environmental Impact Assessment) of buildings, environmental risk assessment tools for fire services.

Review "Environmental impact of fire", D. Martin, M. Tomida, B. Meacham, ARUP and Worcester Polytechnic Institute USA Martin et al. Fire Science Reviews (2016) 5:5, http://dx.doi.org/10.1186/s40038-016-0014-1

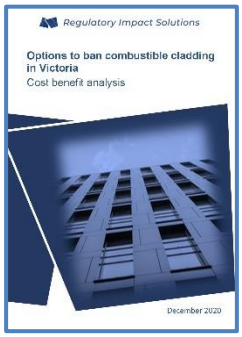
EU FireStat project reports 3 - 5

Efectis has published reports on several packages of the EU FireStat project on fire data and cost/benefit analysis of fire safety actions ("Closing data gaps and paving the way for pan-European Fire Safety Efforts", see DG GROW above). The four reports address: data collection methodologies (on fire causes), terminology for fire statistics (with starting point ISO TS 17755-2), cost-benefit assessment methodology (for fire safety measures), and three case studies applying this cost-benefit methodology. The reports note the wide differences between fire statistics collected in different countries, areas of missing information and uncertainty. It is noted that uncertainty concerning the number of fire injuries is high, as is uncertainty of information concerning fire cause and source of ignition, as well as age of victims. The terminology report aims to provide a basis for an EU minimum data collection (by Member States). The reports on cost-benefit analysis aim to provide a tool for decision making on fire safety policies.



Examples of policies discussed (Report #5) are: Water sprinkler systems in nursing homes, portable water sprinkler systems, fire extinguishers, stove guards, exterior detection for school buildings, use of flame retardants in TV-sets, combustible cladding. Three cases are discussed in detail in Report #6: Smoke detectors in residential buildings, Fire regulation of upholstered furniture and mattresses (summary below), Home fire prevention visits.

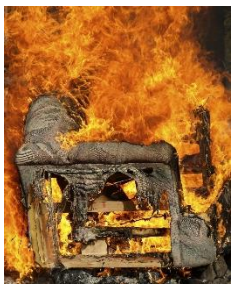
The short chapter on flame retardants in TVs is a summary of Simonson et al. 2006 (SP report 2006:28, DOI, funded by the brominated flame retardant industry) which concludes that using FRs in TVs was beneficial for all scenarios. This report concerns use of DecaBDE in cathode-ray tube TV casings, and the report notes that conditions have changed today with flat-screen TVs (lower operating temperatures and voltages, less flammable material).



The short chapter on combustible building cladding summarises a cost-benefit analysis study for the State Government of Victoria, Australia of options to ban combustible cladding (Victoria Government, 2020).This study concluded that banning ACP (aluminium composite panels) with non-inert fillers would have a net benefit, based on insurance costs savings related to reduced risks of property fire damage, but notes that this would only result if effective information of insurers and compliance are ensured.

EU FireStat project "Closing data gaps and paving the way for pan-European Fire Safety Efforts", Efectis, EU contract refs. SI2.830108. Final reports now published on Task 3 "Data collection methodologies" (Danish Institute of Fire and Security Technology, DBI), 1/12/2021; Task 4 "Terminology" (DBI), 28/10/2021; Task 5 "Cost/benefit assessment methodology to support policy decisions" (Lund University), 9/12/2021; Task 6 "Case studies using cost/benefit assessment methodology" (Lund University), 17/1/2022.

Fire safety regulation of upholstered furniture & mattresses

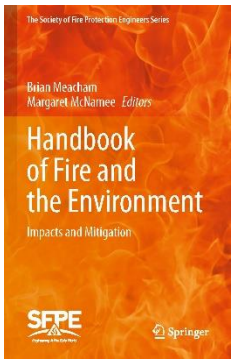


EU FireStat report concludes fire safety regulation upholstered furniture and mattresses in Sweden offers net cost benefit, but with high uncertainty. This is the report of package #5 of the EU FireStat project (see above), led by Efectis, with this work package carried out by Lund University. This short (4-page) "case study" assessment is based on the UK Government DTI study of 2000* and Andersson et al. 2003 (SP Report 2003:22), revisited using Swedish fire statistics for cost-benefit analysis (including lives and property saved, but not injuries). The assessment assumes a Crib5 specification for the furniture item (which can be achieved by flame retardants, interliner or non-flammable materials) and an additional cost for fire safety of 100 € per item. The assessment shows that a fire safety regulation on upholstered furniture can be cost-effective in Sweden, but that the cost-benefit ratio is close to 1 with high uncertainty. In particular, the 100€ cost per item could be lower if made obligatory for all furniture.

EU FireStat project, Efectis, EU contract refs. SI2.830108, final report of Task 6 "Case studies using cost/benefit assessment methodology" (Lund University), 17/1/2022.

This study was updated in 2009 by "A statistical report to investigate the effectiveness of the Furniture and Furnishings (Fire) (Safety) Regulations 1988", Bermann Greenstreet for UK Government (BIS) HERE.

SFPE Handbook of Fire and the Environment



New 500 page reference work from the Society of Fire Protection Engineers on fire impacts on the environment, including mitigation and sustainability. Chapters cover fire fundamentals, historically significant fires, firefighting chemicals, emission measurements, fire and smoke modelling, buildings, wildfires, waste fires, fire-LCA and SAFR-BE (sustainable and fire resilient built environment). The Handbook aims to provide in one resource comprehensive information on the impacts of fire on the environment, tools for assessing these impacts, and approaches to mitigate these impacts, from fires in one building or facility to large area wildfires. Addressed are emissions to air, water and soil, from the fire and from suppression, and impacts of replacement of lost property, remediation and decontamination.

"Handbook of Fire and the Environment. Impacts and Mitigation", Society of Fire Protection Engineers Series, editors B. Meacham, M. McNamee, ISBN 978-3-030-94355-4 https://doi.org/10.1007/978-3-030-94356-1

PUBLISHER INFORMATION

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For abbreviations see: www.pinfa.org