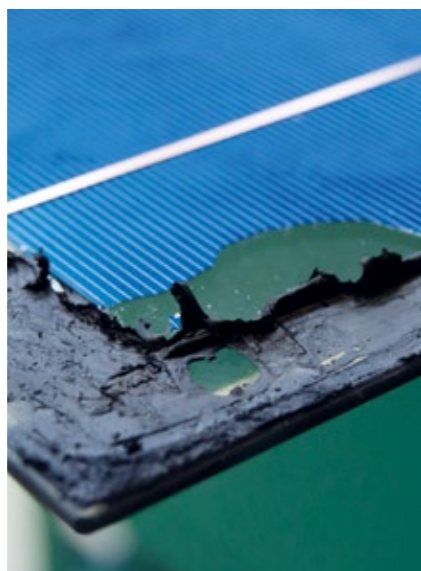


PV recycling in North America

Study on the development of photovoltaic waste quantities

bifa recently completed a study on the development of photovoltaic waste quantities in North America on behalf of the Canadian Standards Association (CSA Group).



In this study, the resulting development in waste quantities was estimated from installation data to date and expected in the future. The cumulative installed quantity of PV systems in North America reached 80 GWp at the end of 2019. The installation base of PV systems is expected to reach around 440 GWp by 2030. If the typical life of a PV system is assumed to be 25 – 30 years, a very large quantity of PV module waste will occur at the end of their use. This waste must be treated properly and resource-efficiently by recovering the materials they contain, such as glass, plastics, metals and solar silicon. The waste management systems required for this must be set up in good time, in order to establish

solar energy as a long-term significant clean energy source in a sustainable, environmentally and resource-efficient way. The "CSA Group's research report on Photovoltaic (PV) Recycling, Reuse and

Decommissioning" includes studies on expected photovoltaic waste development in the USA and Canada. It provides an overview of the legal frameworks and standards for the collection of PV waste, the possible treatments and on recycling. Furthermore, proposals were made for new standards to improve the circular economy of solar modules. The report therefore makes a contribution to the establishment of economic, environmentally-friendly and efficient solutions for treating the increasing quantities of PV waste. The complete report is available under the link

<https://www.csagroup.org/article/research/photovoltaic-pv-recycling-reusing-and-decommissioning/>

solely in English.

Contact: Dr. Karsten Wambach
kwambach@bifa.de

Waste streams containing precious and special metals

Project results now generally accessible

The results of the "ILESA – Smart steering of waste streams containing precious and minor metals: pooling temporary storage, recovery rate" project have been published in the text series of the German Environment Agency.



bifa worked on the project on behalf of the German Environment Agency (UBA), together with the law firm "avocado Rechtsanwälte" and Prof Krupp of the HSAOps research group at Augsburg University of Applied Sciences.

In the project, magnetic materials, vehicle electronics and other waste streams were examined with the objective of increasing recovery of precious and special metals. The following aspects were analysed:

- > Collection logistics concepts and flows of information for consolidating and treating waste
- > Legal aspects of the removal, reco-

- very and labelling obligations and the duty to provide dismantling instructions for waste streams containing precious and special metals
- > Recovery processes, consolidation

- and information concepts for a large number of waste streams
- > Legal, technical and economic analysis of the possibilities of interim storage until recycling technology is available
- > Environmentally optimal or realistically achievable recovery yields of precious and special metals from selected waste streams
- > Assessment of possible measures for increasing the recycling of precious and special metals

The UBA texts on the project (in German and English) are available free of charge from:

<https://www.umweltbundesamt.de/publikationen/ilesa-edel-sondermetallhaltige-abfallstroeme>

Contact: Dr. Siegfried Kreibe,
skreibe@bifa.de

Sustainability of paper production and use

"Sustainable paper cycle – a fact base" study published as bifa-Text No. 70

Paper is a material that is used for a wide variety of purposes and it is used extensively. It is difficult to imagine daily life without it. The primary raw material for paper is wood, i.e. renewable biomass.

Paper is also very easily recyclable and in Germany it is recycled to a high degree. Nonetheless, the sustainability of paper is also considered critically. Working on behalf of the association of German paper mills, ("Verband Deutscher Papierfabriken e. V."), bifa

Umweltinstitut undertook a study to reveal the current facts about the sustainability of paper in Germany. The study focussed on the topics of life-cycle assessment, energy consumption, the origin of the wood used, and recycling. Our cooperation partner was the PTS ("Papier-technische Stiftung"). Life-cycle assessment is the method of choice for disclosing environmental impacts. Only a few life-cycle assessments are available for paper products, which analyse different >>

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Dear Readers, Dear Partners and Customers of bifa,

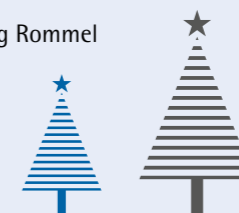
No, this editorial does not begin with the topic that currently appears to introduce every text in the world. I would rather draw your attention to our title story: to the facts and figures of the paper cycle compiled in this unprecedented factual, comprehensive and yet brief form. Furthermore, you will also find information on a selection of current projects, ranging from a hydrogen system study to climate adaptation measures through to PV recycling in North America, from the recyclability of packaging through to waste containing precious and minor metals. As you can see, bifa's work remains interesting and varied.

All this is only possible thanks to the committed efforts of our employees as well as our interaction with research partners, clients and discussion partners. I thank you all very much indeed for your trust and your support.

Despite our current worries and the substantial restrictions, I wish you and yours joy and peace for this Christmas and all the best for the new year!

W. Rommel

Yours, Wolfgang Rommel



and member of
Umwelttechnologie-Cluster
Bayern e. V.
www.umweltcluster.net



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Förderverein KUMAS e. V.
www.kumas.de



Editorial office:
Anita Gottlieb
Tel. +49 821 7000-229
presse@bifa.de

V.i.S.d.P.:
Prof. Dr.-Ing. Wolfgang Rommel
Managing director
Tel. +49 821 7000-111

Tel. +49 821 7000-0
Fax. +49 821 7000-100
solutions@bifa.de
www.bifa.de

bifa Umweltinstitut GmbH
Am Mittleren Moos 46
86167 Augsburg

Photos: title, page 2 and page 3 (below): pixabay.com; all further: bifa Umweltinstitut GmbH

>> environmental impacts. Several studies concentrate solely on the environmental impact of the greenhouse gas effect. Energy consumption in the paper mills makes a decisive contribution to this. In the case of products made from pulp, the raw materials fraction also stands out. The total final energy consumption per tonne of paper has been reduced over the years; by 43 % in Germany since 1980. A significant hurdle to be overcome in order to achieve a further reduction is the paper drying process. The primary pulps imported to Germany mainly come from Brazil, Finland, Sweden, Portugal, Uruguay, Spain and Chile. With the exception of Brazil and Portugal, forest stocks in these countries have increased by expanding managed forests. That German consumption of pulp and paper makes a substantial contribution to the degradation of forests: could not be substantiated overall, the sources indicate that the worldwide clearing or conversion of natural forests – which must be viewed very critically – is mainly undertaken for purposes other than that of paper production. The German paper industry is a recycling pioneer: With a production volume in 2019 of 22.1 million tonnes, re-

covered paper utilization accounted for 17.2 million tonnes and primary pulp utilization for 5.2 million tonnes. Both the paper recovery rate and the recovered paper utilisation rate have increased over the years and both are currently at approx. 78 %. By way of comparison, the recovered paper utilisation rate in the 18 member countries of the Confederation of European Paper Industries, CEPI, is 72 %, the paper recovery rate is 53 %.

The recycling of waste paper makes a significant contribution to sustainable economy, as the raw material wood is used efficiently as a result. The limits of recycling do not lie in the progressive quality loss of the fibre material: wastepaper fibres can be reused significantly more times than the seven times frequently assumed. The fact that the limit of the paper recovery rate is an estimated 85 % is mainly due to processing reasons and the recyclability limits of certain paper products, e.g. sanitary



Stages in the paper-wastepaper cycle and important input and output streams.

papers, wallpapers or composite packaging. bifa Text No. 70 "Sustainable paper cycle – a fact base" ("Nachhaltiger Papierkreislauf – eine Faktenbasis") can be ordered from mid-January from www.bifa.de.

Contact: Dr. Wolfram Dietz
wdietz@bifa.de

Recyclability of packaging

bifa is updating the ISD method for assessing recyclability

The German Packaging Act obliges the so-called "dual systems" (waste collection and recovery systems) to give preference to recyclable packaging rather than non-recyclable packaging in their licence fees.

bifa Umweltinstitut, together with the dual system Interseroh, developed an assessment method for this in 2018. This method is improved continuously. It has now been updated on the basis

of the minimum standard published on 01/09/2020 by the Central Agency Packaging Register ("Zentralen Stelle Verpackungsregister").

From bifa's point of view the minimum standard of the Central Agency is very helpful as a uniform framework for all dual systems and distributors of retail packaging. The minimum standard is a binding rule for the uniform assessment of recycling-critical packaging designs.

bifa welcomes the updating of the minimum standard, which takes into account new developments and knowledge. An indispensable precondition for recyclability is the existence of a sorting and recovery infrastructure, which allows high-quality recycling of the packaging material. The updated minimum standard reiterates that only limited capacities are

currently available for high-quality recovery of packaging made of polystyrene, composite paper-based packaging and small, flexible packaging made of polyolefins. Limited recyclability must therefore be assumed for such packaging.

bifa will be pleased to help you to assess the recyclability of packaging and to identify appropriate potential for improvement. It must be noted, however, that the assessment of recyclability does not cover all aspects of sustainable packaging design. Life-cycle assessments enable a more comprehensive assessment here. Life-cycle assessment is one of the core areas of bifa's work. We have been producing life-cycle assessments for all kinds of different packaging for many years.

Contact: Thorsten Pitschke
tpitschke@bifa.de



Producing hydrogen from Bavarian commercial waste

New bifa study: thermochemical hydrogen production from waste

In view of the largely full utilisation of thermal waste treatment plant capacity for municipal waste, the recovery of non-recyclable commercial waste poses an additional challenge. At the same time, the energy industry faces the task of establishing hydrogen as an energy source and storage medium of the future.

In the future, the path of producing hydrogen with regenerative electricity through electrolysis will be limited by the electricity availability – even if regenerative electricity sources were to be promoted decisively. bifa has set its sights on these current challenges simultaneously in a study that has just begun. This is because hydrogen can also be obtained thermochemically – that is, at high temperatures

– from organic materials. Byproducts and waste products with negative market value, for example certain commercial wastes, are the first to come into consideration. Although the relevant gasification technologies are known, they are not established in Germany and Europe. They have to be adapted to targeted hydrogen production. With the study, which is sponsored by the Bavarian State Ministry of the Environment and Consumer Protection (Bayerischen Staatsministerium für Umwelt und Verbraucherschutz), bifa has set itself the goal of analysing and clarifying the potential of thermochemical hydrogen production



from waste in the specific economic environment of Bavaria. What technical, economic and realisable potential exists? Which boundary conditions must be set in order to realise the potential? The system study integrates technical, economic, ecological and societal aspects. It is focussed on commercial waste. Practical orientation and realistic implementation of the results will ensure the active involvement of relevant stakeholders from industry, associations and municipalities. Here bifa is cooperating with the established environmental expertise network, KUMAS Kompetenzzentrum Umwelt e. V..

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Contact: Dr. Wolfram Dietz
wdietz@bifa.de

Climate adaptation concept for the Bavarian capital Munich

Are the measures working?

The action plan for adapting to climate change, developed by bifa in 2016 under the leadership of the Health and Environment department, is now being tested. bifa received a follow-up order from the state capital: The monitoring and continuation of the adaptation concept.

Alongside climate protection, adapting to a changing climate is another important task for local authorities. On the basis of sound analyses and climate modelling, 26 measures were therefore developed for the City of Munich, which are intended to counteract effectively the expected temperature rise, increased heat waves and more frequent heavy rainfall events. The measures which cover, for example, flood management, health protection and crisis prevention, were adopted unanimously by Munich's city council in November 2016. The aim now is to determine the extent to which they could actually be imple-



mented. A cross-departmental project group has already been set up as part of the monitoring. In addition, four thematic work groups were formed on "Urban development, green spaces and the ecosystem", "Green in the city and buildings", "Water and precipitation" and "Health". bifa's task now is to mo-

derate this process and to update the city's adaptation concept. An interim report on the implementation status of the measures is due to be submitted to the city council in the spring of 2021.

Contact: Dr. Michael Schneider
mschneider@bifa.de