**Committee of Experts on the Transport of Dangerous Goods
and on the Globally Harmonized System of Classification
and Labelling of Chemicals**

**Sub-Committee of Experts on the Globally Harmonized
System of Classification and Labelling of Chemicals**   **23 May 2019**

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Item 3 (a) of the provisional agenda
Hazard communication: practical labelling issues

Thought starter on digitalisation of hazard information for chemical products

Transmitted by the European Chemical Industry Council (CEFIC) on behalf of the informal working group on practical labelling issues

Background

1.   At its thirty-sixth meeting, the Sub-Committee acknowledged the growing use of digitalisation in the context of chemicals and inserted in the 2019-2020 program of work specific work items on how to consider the opportunities that digitalization may bring to convey hazard information and make proposals to address them. This activity will be carried out by practical labelling issues working group:

(a)   «Review the existing digital means of communication that can be used to convey GHS hazard information to users (e.g. electronic label, QR code etc.),;

(b)   consider the development of general principles and criteria on the provision of this information digitally;

(c)   develop guidance and examples wherever appropriate. This can also include an assessment of backup solutions for users who are unable to connect to digital information. »

2.   In order to initiate the discussion within the working group, this thought starter has been drafted by the experts from International Association for Soaps, Detergents and Maintenance Products (A.I.S.E.), People's Republic of China, Responsible Packaging Management of Southern Africa (RPMASA), International Paint and Printing Ink Council (IPPIC) and the European Chemical Industry Council (CEFIC). It was subsequently enriched by contributions from members of the group during and after a web conference.

Discussion

3.   The application of electronic technology in modern society is more and more extensive, and it is increasingly part of people's lives, including banking and retail shopping, software download, Government e-services etc. Similarly, the application of electronic labels has gradually extended to many fields, such as transportation, logistics, daily management and supervision of chemicals, etc. With the development of science and technology, it will also be an indispensable means of social production and life in the future.

4.   The increasing use of digital technologies and on-line purchases create also new challenges in the way the information on hazardous products is provided to the general public. Therefore, it is considered opportune to explore how digital means may contribute to GHS hazard communication (e.g. through development of guidelines, best practices etc.)

5.   Consumer research, (see UN/SCEGHS/34/INF.5 *"10 years of GHS: More effective labelling for hazardous consumer products?"* http://www.unece.org/fileadmin/DAM/ trans/doc/2017/dgac10c4/UN-SCEGHS-34-INF05e.pdf) has shown that the current regulatory implementation of the GHS labelling of chemicals may not be fully effective at conveying safe use and hazard information to the general public (this is particularly problematic on small packaging when multi-languages are required). Consumers experience the labels as overloaded and unattractive, and text is often too small to read. In addition, consumers frequently find the content too technical and difficult to understand, hence miss the crucial safety warnings. Similar findings were also found by the Consumer Labelling Initiative focused on pesticides, insecticides and household hard surface cleaners (US EPA 1996). Digitalization offers opportunities to address the above challenges.

6.   Digitalization offers also substantial opportunities in terms of an improved hazard communication for consumers and workers: e.g., language and adaptable font size to meet user's needs/preferences; customized search options for key words could allow a swift identification of the key information (e.g. presence of any, or a specific sensitizing substance/s). In some jurisdictions different information is required on product labels and in the workplace[1] , so if a product on general sale is purchased for use in work, a digital solution would allow the relevant information to be retrieved readily. Information such as safe use instructions and sustainable tips could also be easily accommodated digitally; updates and new information could also be provided timely via electronic labels. In addition, digitalization offers a viable option to complement the limited information given on a physical label of very small packaging and to address the issue of online purchases made in different countries (e.g. different languages). However, there have been some concerns on how to ensure that essential information is immediately available.

7.   The Background document (Annex) provides a state of the art with regard digital means penetration and technologies that could be used to convey hazard information. This information is considered essential to demonstrate and support the use of digital means under GHS.

8.   The main findings of the Background document (Annex) are summarized below:

(a)   Several international organizations and governments have adopted policies to promote and support digitalisation including in the field of chemicals management and labelling information (UN, OECD, EU Commission, Peoples Republic of China, United States etc.)

(b)   The use of digital means to address hazard information for chemicals is increasing worldwide. Digital means offer significant advantages in terms of a more targeted and effective hazard communication. However, no global standards are currently available covering hazardous labelling of chemicals.

(c)   An increasing proportion of the world's population has access to internet information % on average in 2016 in OECD member countries, 95% for young people). In the short term, internet access is expected to further increase and will become part of the daily life of every individual, business and government.

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[1]   e.g. Mexican standard NOM-003-SSA1-2006 on paint labelling and workplace hazard communication standard NOM-018-STPS-2015.

(d)   In developed countries active mobile broadband subscriptions exceeded 100%, in the developing world this average to 61%. Mobile high-speed broadband access in OECD countries was on average 99.3% in 2016.

(e)   Bar code scanning/QR code seem to be the most suitable approach for the purpose of linking consumer products to their online/digital information. Radio frequency identification (RFID) can also be considered as a suitable option, for the transport and management of chemicals.

(f)   The most effective backup solution (off line) is a telephone number that the user can call to access the hazardous information; pre-record information should also be allowed. This can be complemented with automatic text message option (SMS generated via a one-time automated response).

(g)   Existing digital technologies and related widespread use across the population support a potential use digital technologies for labelling information. This presents novel opportunities and challenges for users seeking to access information. While there are some challenges, in several jurisdictions most consumers/users would be able to access this information given the proper education and tools to do so.

Proposal

9.   During its meeting planned during the plenary on Tuesday, 9 July 2019, the WG is invited to assess the preliminary findings reported on this paper and advise on the best approach to tackle the mandate provided by the Sub-Committee.

Call for additional data

(a)   The WG is invited to provide any additional example of regulation, standard or recommendation in the use of digital means to convey hazard/safety information or similar.

(b)   A review of the GHS principles for labelling and thoughts on guidelines or guiding principles on the application of digitalization on labels

(c)   In view of potential overlaps, it is proposed to regularly inform UN TDG of the outcome of the discussion held by this WG on digitalisation.

Open questions for discussion

10.   To facilitate the discussion, the WG should provide feedback on the following questions and comments. The questions below should be intended as a thought starter to stimulate discussion and they are not provided in a specific order or priority:

(a)   <u>Benefits</u> - The use of digital information provides opportunities to foster a more effective and targeted hazard communication (language, readability, search functions, comparability etc.). The WG is invited to discuss the benefits related to the use of digital technologies (see paragraph 5) and indicate the most relevant elements for a potential GHS application.

(b)   <u>Concerns</u> - The use of digital information can create concerns related to access to the information (availability, complexity etc.). The WG is invited to discuss what are the potential issues or drawbacks of the use of digitalization.

(c)   <u>Available technologies</u>: Bar code/QR code scanning and RFID today seem to be the most relevant technologies to link a chemical with the digital information

Access to digital information on chemicals hazard should be simple and user friendly; Chapter 7 in the Background document (Annex) provides some basic principles for discussion.

(d)   Backup - Discuss the backup options in case digital means are not able to operate (lack of connectivity, internet failure etc.). Chapter 5 in the Background document (Annex) provides a first assessment of potential options.

(e)   Digital label - The use of digital information can be envisaged for different purposes; such as to be used in parallel of the traditional physical label (providing the same information), or to complement the physical label (providing information not present on the label).

(f)   Parallel use - Under which conditions digital information can be used in parallel of traditional "physical" label (e.g. establish principles such as that digital information should provide at least an equivalent level of information than traditional paper label and should not contradict or cast doubts)

(g)   Complementary use - Under which conditions digital information can be used to complement the physical label (e.g. to complement the limited information given on the physical label of very small packaging in accordance with 1.4.10.5.4.4, or to give supplemental information, safe use instructions etc.)

(h)   Alternative use - Under which conditions, and/or circumstances, could digital information be used as an alternative to physical labelling (e.g. transport phase or use of non-standardized or supplemental information, see 1.4.6.3).

(i)   Information layout - In case of use of digital means, the way the hazard information is displayed (e.g. the layout) should be considered as the digital display might result in a reformatting of the label; principles of priority should be provided (e.g. show always first standardized label elements under 1.4.6.2. such as hazard symbols, signal words and hazard statements).

(j)   Label definition - Definition of "label" under Chapter 1.2 GHS should be probably updated to accommodate also the digital information option *("Label means an appropriate group of written, printed or graphic information elements concerning a hazardous product, selected as relevant to the target sector(s), that is affixed to, printed on, or attached to the immediate container of a hazardous product, or to the outside packaging of a hazardous product".*

(k)   Sector differences - Differences between sectors (e.g., the workplace and consumer sector), should be considered while exploring digitalisation.

ANNEX

Background Document:
Digitalisation of hazard information for chemical products

Table of content

Chapter 1 Political framework

Several international organizations and governments have adopted policies to promote and support digitalisation.

1.   The UN High-level Panel on Digital Cooperation (UN, 2018) was convened mid 2018 to strengthen cooperation in the digital space among all relevant stakeholders. Digital technologies make a significant contribution to the realisation of the 2030 Agenda for Sustainable Development and cut uniquely across international boundaries, policy silos and professional domains. The Panel is expected to submit its final report mid 2019. This activity recognises that "soon, every industry will be digitized, and this will have a tremendous impact on every aspect of life" and that "if all people, especially the poorest and most vulnerable, have equal access to digital technology, they will use it to improve life for themselves and their families and raise their voices in conversations about what the future holds."

2.   The European Commission launched the "Digital Single Market" in 2015 to deliver legislative proposals in the area of e-commerce, copyright, audio-visuals, the telecoms review, ePrivacy, harmonisation of digital rights, affordable parcel delivery, harmonised VAT rules and cyber security (European Parliament, 2018). This has led to achievements including lower prices for electronic communication, and better Internet connectivity for all with a comprehensive basic broadband coverage. The Digital Agenda for Europe aims at maximising the growth potential of the digital economy, by promoting digital skills and high performance computing, digitising industry and services, developing artificial intelligence and modernising public services.

3.   On 4th July 2015, the Chinese State Council released the *"Guiding Opinions on Actively Promoting the "Internet Plus" Action Plan",* with the stated aim of achieving rapid, high-quality economic growth and industry development, taking advantage of China's scale and applications of the Internet to drive deep and comprehensive integration between the Internet and the real economy. Across the various actions Integration and innovation of internet will be explored for manufacturing, logistics, e-commerce, transport etc. (http://www.gov.cn/zhengce/content/2015-07/04/content_10002.htm   and http://www.usito.org/news/state-council-provides-guidance-internet-plus-action-plan).

4.   Eurasian Economic Union established mainstream development of digitalization within the *"EAEU Digital Agenda 2025"* signed on October 11, 2017 by Heads of State. It includes the strengthening the processes of economic integration and international cooperation; creating favourable environments for regional digital initiatives; creating a common digital infrastructure and digital platforms; digitalization of leading economic sectors economy and regional markets.

5.   According to OECD Secretary-General speech to the European Parliament in 2017, 34 OECD countries have a national digital strategy, and 5 of them appointed a special body dedicated to digital affairs. He also mentioned that *"To fully benefit from the opportunities linked to digitalisation, everyone – individuals, businesses and governments – needs reliable and affordable access to digital networks and services, as well as appropriate skills to use the technology. Opportunities abound, but governments must review legacy frameworks, embrace innovation and foster competition. "*

Chapter 2 Existing legislation or standard on the use of digital means for chemical / product information

The use of digital means to address hazard information for chemicals is increasing worldwide. Digital means offer significant advantages in terms of a more targeted and effective hazard communication. However, no global standards are currently available covering labelling of chemicals.

6.   Chinese standard - China has established the local standard DB21/T 2030.1-2012 (Specification for the Application of Electronic Labels for the Identification of Hazardous Chemicals Cylinders Part 1: Electronic Label Codes for Cylinders). In the field of chemical management, China is also drafting the national standards: Guidance on information management of Chemicals, which includes an application standard of electronic labels. This determines the technical requirements of permitted electronic labels and related equipment based on GHS classification of chemicals, including information items, the data format and coding rules by using technologies such as RFID or magnetic cards. China is also actively promoting the application of electronic labels for chemicals. There are cases in the following fields: producing process, cylinder's management, sample's management in laboratory, warehouse's management, supervision of the competent authority. The types of electronic labels include QR codes, and radio frequency tags (RFID). Specific application cases include: Monitoring by using Electronic Label in Shanghai Chemical Industry Zone, Supervision of Dangerous Chemicals Transportation in Shantou, Electronic Sample Management in Shandong Port.

7.   US National Bioengineered Food Disclosure Standard - On July 29, 2016, US Public Law 114-216[2] introduced new national mandatory bioengineered food disclosure standard. The new Standard provides electronic or digital link disclosure for labelling information on bioengineered foods for retail sale. On December 21, 2018 USDA published the National Bioengineered Food Disclosure Standard (Doc. No. AMS–TM–17–005). This standard establishes the principle that electronic disclosure be accompanied by a telephone number that a consumer can call to access the disclosure information. The standard requested to run a study to identify potential technological challenges that may impact whether consumers would have access to the information through electronic or digital disclosure methods. Most consumers in the study experienced some technical challenges in accessing the bioengineered food disclosures on their phones. The study concluded that "The use of electronic and digital links presents novel opportunities and challenges for consumers seeking to access information ... While there are some notable challenges, most consumers would be able to access this information given the proper education and tools to do so." Based on the study results, the USDA determined that "consumers would not have sufficient access to bioengineering disclosure through electronic or digital means under ordinary shopping conditions at this time" and added a text message disclosure option.

8.   EU Detergents Regulation -The EU Detergents Regulation (EC No 648/2004) requires that manufacturers make available digitally an ingredient data sheet (i.e. a web site open to the public). This must contain the names (international nomenclature) of all ingredients, in order of decreasing weight percentage. The website address is to be given on

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[2]   https://www.govinfo.gov/content/pkg/PLAW-114publ216/html/PLAW-114publ216.htm and https://www.federalregister.gov/documents/2018/12/21/2018-27283/national-bioengineered-food-disclosure-standard

the packaging. Interested consumers can access the ingredient information via a limited number of steps, browsing to the relevant section of this web site and selecting the product category and brand. This requirement has been in force since 2004 and is since then systematically implemented by the European detergents industry.

9.   Chestny ZNAK (Unified Russian national track & trace digital system[3]) - By 2024, this system will cover all industries, from cigarettes and medications, to clothing and child nutrition. Recording the movements at each stage in the Chestny ZNAK track & trace system prevents the appearance of product clones and also prevents goods from being repeatedly brought to market, including those with an expired shelf life. The system uses the Data Matrix code that is divided into two parts: the ID code, which determines the product's position in the track & trace system and in the unified catalogue of goods, and the verification code or crypto-tail, which is generated by the operator using domestic cryptography technologies.

10.   <u>California Cleaning Product Right to Know Act</u> - In the US, the California Cleaning Product Right to Know Act (California Senate Bill No. 258[4] requires manufacturers to disclose ingredient information on the product label as of 2021, and on the manufacturer's website as of 2020, and to list this web address on the label. Whereas the product label can be limited to specific hazardous ingredients, the online ingredient list shall contain the names (international nomenclature) of all ingredients, in order of decreasing weight percentage in the formula. New York State is working on a similar requirement.

11.   <u>Medicines</u> - For medicines in Europe, making available product information electronically is currently under consideration (European Medicines Agency, 2019). A workshop in November 2018 with all stakeholders resulted in a proposal for 'key principles' on electronic product information (ePI). This includes the development of a common EU standard. It will facilitate creation of product information that is accessible to everyone, including patients/consumers with visual impairments and those with low literacy levels (e.g. audible formats).

Online general information on chemical substances

12.   <u>ECHA INFOCARDS</u> - The European Chemicals Agency provides Infocards to the general public via the http://echa.europa.eu website (ECHA, 2018). This is a dissemination tool to make the technical information published from the Agency's substance databases more accessible. The Infocard serves as a high-level summary for a broad public, consisting of information that is most relevant to an audience of consumers, downstream users and professionals active in the chemical industry. With this and related dissemination tools such as the Brief Profile (the 'second tier'), ECHA wishes to make people more aware of the risks to which they may be exposed, thus encouraging an overall safer use of chemicals. This information is accessible through a search function on the ECHA web site.

13.   <u>OECD eChem portal</u> - OECD developed eChemPortal: a global portal to information on chemical substances, in response to the request by the World Summit on Sustainable Development to improve the availability of hazard data on chemicals. A search by GHS classification in eChemPortal allows users, for an individual chemical, to view GHS classifications which have undergone a review by a regulatory body or intergovernmental organisation and offers direct links to the full information in the participating data sources.

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[3]   Chestny ZNAK see https://chestnyznak.ru/en/o-chestnom-znake/#2
[4]   California Cleaning Product Right to Know Act See
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB258

Online information about consumer product ingredients / safety

14.   SMARTLABEL - Launched in 2015, SmartLabel (GMA, 2018) was developed by a partnership between the Grocery Manufacturers Association (GMA) and the Food Marketing Institute (FMI) in the US. It provides details about what ingredients are in products, including information about allergens, third-party certifications, usage instructions, social compliance programs, and safe handling. Within scope are food, beverage, supplement, household, pet care, personal care, and over-the-counter products. All the information is contained in a central database, organized in a consistent format, based on the same general landing page layout irrespective of the product researched. SmartLabel enables consumers to access the information in several different ways. The specific product's information is reached directly when the QR code on the label is scanned with a smartphone - either using the SmartLabel app - or using a QR code reader (as included standard in the latest versions of Google Chrome and Apple iOS). Alternatively the information can be found by a product search on the SmartLabel website, which can be reached directly or via a link on the individual brand website. Finally, all information on SmartLabel can also be obtained without Internet access, by calling the toll-free phone number on pack. By end 2018, the system contained detailed information from 826 brands on more than 36000 products.

15.   Cleanright.eu – Cleanright (A.I.S.E. & CEFIC, 2019) is a service provided to consumers to help them understand the broad range of cleaning and maintenance products available, the benefits each type of product offers, and how to get the best results from them in a safe and environmentally responsible way. The multilingual, non-branded website makes available an explanation on the hazards and risks of all key ingredients that may be used in these products including frame formulation. In addition, general guidance on the safe and sustainable use of detergents and cleaning products is provided, as well as background on the applicable regulations and on voluntary industry initiatives. Cleanright is not linked to individual products, but most of detergents and cleaning products in Europe have the link to the website on their label.

16.   AskREACH - AskREACH is a European Union "LIFE" Project that was launched in September 2017 for a five year term, to develop a central IT system for the communication on Substances of Very High Concern (SVHC) in articles (Schenten & Schönborn, 2018). This information shall be accessible to consumers via a smartphone application. Ultimately, making available on-the-spot information (at the time of the purchase decision) is expected to increase the market demand for SVHC free products. Within this project, an assessment was conducted on consumer smartphone apps for problematic substances in products.

17.   GS1 – GS1 (Global Standards One) is a worldwide organisation focusing on standards for electronic communication between companies. GS1 has presence in over 100 countries. GS1 is most known for owning the product barcodes, that allow a unique identification of products across the globe, and for the standardisation of electronic information exchange. The GS1 Digital Link (GS1, 2018) will enable a single identification approach that can support both product identification for supply chain applications and a link to online material. The use of 2D barcodes like ISO/IEC 18004 QR Code or ISO/IEC 16022 DataMatrix ECC 200, in addition to 1D barcodes on consumer packs, is a core driver of this work. GS1 (2018) refers to SmartLabel as an approach that already uses a QR code to directly link a physical product with the associated online data, however without a structured approach. GS1's vision goes further by integrating on-line ingredient and safety information in a holistic product identification system.

Online information to workers on product ingredients / safety and electronic labels

18.   RFID In China electronic labels are already used for the automatic identification of freight containers in the supply chain. By scanning a "license plate tag" on the container with radio frequency identification (RFID), information can be transferred from a container to automatic processing systems by electronic means. The devices and procedures are covered in ISO standard ISO/TS 10891:2009, as well as in China's national standard GB/T 26934-2011.

19.   PIKA (http://pika.nl) is an electronic Safety Data Sheet (SDS) system that consists of a database and a smartphone app. Product safety information and safety data sheets are shared digitally with employees via the app, so they have correct and up-to-date safety information at hand, all the time, at any location. Within a company, a database is built containing the hazard and safety information of all chemicals used in the company. All information that normally appears on workplace instruction cards is included and can be supplemented with full SDS information. For easier product recognition, product photos can be added. All the product information from the database is then available to all users within the company via the search function in the app. Furthermore, users can be automatically warned about critical updates to relevant information via push notifications. Note that this approach does not work via a direct link e.g. through a bar code.

20.   ChemChain (http://chemcha.in) will be an open-source global block chain platform to transfer information on hazardous chemicals along the value chain, from chemical manufacturers to consumers, recyclers and waste operators. ChemChain tokens represent quantities of chemicals. They carry chemical information and accumulate knowledge on uses and applications. The target timing for implementation is end 2019.

Chapter 3 Mobile data connectivity

Internet access in general

The vast majority of OECD population has access to internet information (83% on average in 2016). When it relates to young people this increases to 95%. In the short term internet access is expected to further increase and will become part of the daily life of individuals, businesses and governments.

21.   OECD (2017) reports that in 2016, 83% of the adult population in the OECD member countries (i.e. mainly the developed world) had Internet access, and that 73% used the Internet on a daily basis. According to ITU (2018) statistics, in 2018 on a global basis (including developed and developing countries), 51% of the population are Internet users. For the developed world this is 81% (i.e. similar to the OECD figures). The proportion of daily Internet users had a 2.5 fold increase versus 10 years before (OECD, 2017). Note that in 2015-16, 80% of Internet users explicitly reported to have used the web to obtain information on goods and products.

22.   There is a large variation between countries and age groups. Internet use is over 95% in the most connected countries, while in the least connected OECD countries this is 60%. (OECD, 2017). In developed countries, the proportion of households with Internet access at home is twice as high as in developing countries (ITU, 2017). For example in Europe the connectivity at home is 84.2%, while in Africa it is 18%. Only 15% of households in the least developed countries have Internet access at home. In these countries, many Internet users are accessing the Internet from work, schools and universities or from other shared public connections outside the home.

23.   Across the OECD over 95% of the young population (aged 16-24) has Internet access - and in every single OECD country this connectivity rate exceeds 80% (OECD, 2017). This

same percentage is reported as the average across the globe (104 countries) by ITU (2017). However, there is a notable difference between developed countries, where 94% of young people aged 15-24 use the Internet, compared to 67% in developing countries, and only 30% in the least developed countries. OECD (2017) mentions that for the older generation (55+), the education level is an important determining factor: Internet use among people with a tertiary education is at par with the general population, whereas for poorly educated seniors it drops to 10-30% except for the best connected countries.

Mobile Internet access

Mobile high speed broadband access in OECD countries was on average 99.3% in 2016. In developed countries active mobile broadband subscriptions exceeded 100%, in the developing world this averages to 61%.

24.   Mobile high-speed broadband access in the OECD countries was on average 99.3% in 2016 - nearly one subscription for every inhabitant. In over half of the OECD countries the mobile access rate exceeds 80%. In the EU, in 2016 two out of three Internet users had mobile access through a (smart)phone. This is an increase by more than 250% in five years' time. The mobile access share is reaching 90% in some countries. (OECD, 2017).

25.   Globally, the number of mobile broadband subscriptions has grown by more than 20% annually over the last five years (ITU, 2017) - and has exceeded 5 billion globally by end 2018 (ITU, 2018). Active mobile broadband subscriptions exceeded 100% (111 subscriptions per 100 inhabitants) in the developed world in 2018. In the developing world this averages at 61%. The GSM Association (2018) predicts that the number of unique mobile subscribers will reach 5.9 billion by 2025, equivalent to 71% of the world's population.

26.   The US based study of "Electronic or digital link disclosure"[5] found that 77% of Americans owned a smartphone in 2016, a 9 % increase compared to 2015. In addition, 93.6 % of all Americans live in counties with access to broadband download speeds of 10 Mbps (which would allow one to load an averaged sized webpage within time of 2 seconds or less). However, more than 20 million Americans did not have access to broadband sufficient to load a basic electronic or digital link, and 39 percent of rural Americans and 41 percent of Americans living on tribal lands lacked access to the U.S. Federal Communications Commission's standard for advanced broadband service of 25 Mbps. Additionally, the study noted that download times could be notably different depending on the mobile provider.

27.   In terms of signal coverage, OpenSignal (2016) assessed the availability of at least 3G (or better) connectivity across 95 countries. This was measured as signal availability for mobile Internet users in percent of the time. This exceeded 80% in 61 countries, while it was less than 50% in only 2 countries. In addition, mobile users can be connected online via Wi-Fi networks rather than a mobile broadband signal.

28.   Internet access and Mobile data are relatively common in several jurisdictions and are expected to further increase. This supports a potential use of digital technologies to convey GHS hazard information

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[5]   https://www.ams.usda.gov/reports/study-electronic-or-digital-disclosure

Chapter 4 Existing and emerging digital technologies

Bar code scanning

29.   The Quick Response (QR) code was first introduced in 1994 in the car industry to track vehicles and parts in the manufacturing process, and later gradually started being used on consumer product labels to allow linking to (mostly commercial) information. In the past, QR codes never gained substantial traction because they required specific apps to be installed and because much of the information they linked to tended to be not relevant, or even not online.

30.   The Study of Electronic or Digital Disclosure showed that while the QR code is the most widely-used form of electronic disclosure, most consumers were unfamiliar with it or assumed it was for the manufacturer. Many study participants associated QR codes with sales or discounts, rather than additional food information. A 2016 study from the Annenberg Public Policy Center found that only 15 percent of Americans scanned barcodes or QR codes to find information about a product's ingredients or nutrition information. The study also noted that the fact that QR codes are for a variety of purposes (e.g. brand marketing, tickets, social media, coupons, self-checkout, etc.) may contribute to consumer confusion.

31.   However, barcode scanning (two-dimensional codes, such as QR, as well as traditional one-dimensional bar codes) has recently become a standard feature in new smartphones, and is now being used for consumer relevant actions. In China, code-scanning with the smartphone's camera is one of the central tools in the popular WeChat ecosystem: to exchange contact information, interact with brands, buy clothes and food, access the web. This inspired the popular social media app Snap Chat to introduce their own variant of QR codes to add contacts or to unlock features. A similar development took place at Facebook. Major smartphone developers announced that digital link scanning functionalities will be integrated in the system, as a result more consumers will have greater ease of access to QR codes in the future. This may be facilitated by an accompanying statement such as "scan here for additional safety information."

32.   Digital watermark technology is also becoming available on the market; this is based on special printing techniques that are imperceptible to consumers but can scanned anywhere on the package using a smartphone or other device

33.   *Preliminary assessment: Including a bar code on a label requires no specific technological interventions and has no impact on materials, recycling, etc. And a large majority of smartphone users will in the near term have become familiar with how to use such codes. Hence, in the short term, this approach appears to be suitable for the purpose of linking products to their online information.*

Voice recognition systems

34.   It is expected that in the next decade voice recognition linked to smart / connected appliances and the Internet of Things will revolutionise daily household practices (Euromonitor, 2018).

35.   *Preliminary assessment: Whether this technology may be applicable for accessing composition and safety information for individual products is not a given. Importantly, to access product-specific information it is essential that the product of interest be uniquely and unambiguously identified. This may be done via an on-pack code (human readable or machine scannable), or via a decision tree approach based on product type, brand name, variant, etc. Most likely a voice-based approach is less convenient for this purpose.*

Short range wireless communication: NFC / RFID

36.   Radio Frequency Identification (RFID) tags are already commonly used today. For example in the logistics industry to identify containers; but also as subcutaneous chips to identify animals, even with people e.g. for access control.

37.   Based on RFID, Near Field Communication (NFC) enables short range communication between compatible devices. This requires at least one transmitting device, and another to receive the signal. Passive NFC devices include tags, and other small transmitters, that can send information to other NFC devices without the need for a power source of their own. Active devices are able to both send and receive data, and can communicate with each other as well as with passive devices. Smartphones are by far the most common form of active NFC device. Public transport card readers and touch payment terminals are also good examples. The technology uses electromagnetic induction in order to transmit information. This means that passive devices don't require their own power supply but can be powered by the electromagnetic field produced by an active NFC component when it comes into range. Only recent and higher level smartphones have the ability to read NFC tags, and specific reader apps have to be installed. However this is evolving, e.g. the latest iPhone models natively include NFC reading capability. It may be expected that in the short to medium term this capability will be common.

38.   Low cost passive NFC tags are commercially available and might be considered appropriate for disposable consumer product packaging. Nevertheless, this would have a sustainability impact due to the increase in packaging - and it would lead to recyclability issues. With the shift to consumer focused NFC tags, and deployment of billions of smart labels and packaging, a focus on sustainability is becoming a priority. A traditional NFC inlay is made from PET (polyethylene terephthalate), aluminium or copper for the antenna, an integrated circuit for the NFC chip (silicon, gold...) and an adhesive. When used in the quantity and form of an NFC inlay, PET is difficult to separate from other components for recycling, and tends to jam processing filters. In addition, the metal of an NFC antenna is difficult to recover and recycle. Industry efforts are already being exercised that will make NFC tags better for the environment. One possible step is replacing PET with a paper-based substrate. Alternative ways to make the metal antennas, including "printing" the antennas, are also being examined.

39.   *Preliminary assessment: In the short term, the environmental downsides (packaging increase, recyclability implications) as well as technical complexity and cost play against the use of NFC tags as the means to link a product to its online data. Furthermore, there may not yet be a critical mass of consumers who can easily use this technology. However, longer term, NFC may have the potential to be a more user friendly alternative to bar codes, as it only requires to bring the phone close to the tag; there is no need to launch a reader app and frame/focus the code with the camera.*

Chapter 5 backup solutions

Telephone line is considered the most reliable backup option for electronic labelling information disclosure; it can be complemented with mobile phone text message option

40.   Backup solutions are needed to ensure access to critical information when online data cannot be consulted, especially when digital means are used as substitute to GHS physical label. The most intuitive backup for an online information system may be provided via a 24/7 consumer information phone line. ITU (2018) statistics report that for 2018, globally the mobile phone subscription rate is above 100% (with 107 subscriptions per 100 individuals) - and importantly this also applies to the developing world (102%). In the least developed

countries, full mobile phone coverage has not yet been reached, but nevertheless with 72.4 mobile phone subscriptions per 100 people this does represent a substantial majority of the population.

41.   The preference of a telephone line as backup option for electronic labelling information disclosure has also been recently confirmed by the USDA National Bioengineered Food Disclosure Standard (published on December 2018). This standard introduced an electronic or digital link information disclosure option and assessed its feasibility also in relation to the potential backup solution (telephone line). The standard concluded that the most effective backup solution (off line) is a telephone number that the user can call to access the required labelling information.

42.   As main backup solution to the electronic hazardous labelling information disclosure, the telephone number should be available at all times of the day and clearly provide labelling information to the caller. Pre-record information option should also be allowed; if relevant, language options should also be provided. This option could also be complemented with mobile phone text message option (SMS generated via a one-time automated response). The telephone number and instruction "Call 1-000-234-000 for labelling information" or "send a text to 1-000 for labelling information" must be located in close proximity to the electronic digital link.

43.   Additional backup solutions could be achieved at the point of purchase via e-reader able to display the needed information also in area not covered by internet connection and/or making available physically a booklet. However, it is acknowledged that installing in retail stores electronic or digital link scanners can be a challenge for small retailers and rural areas.

Chapter 6 Draft principles for a user-friendly access to digital information

Visual cue

44.   It is proposed that a standardised visual cue be developed, for use across all product categories, to indicate either the code for accessing the on-line information or the website address on which this information can be accessed (below an icon is proposed to indicate *'further information is available digitally'*. In alternative or in addition, a standard statement can be used, such as *"Scan here/icon for more information on hazards and safe use"*. Alternative way of disclosure, such as a telephone number should appear in close proximity to the digital link.

Free access to the information and respect of privacy

45.   The access to the information via the digital link should be free of charge and not be subject to any restriction or condition. For instance, access should not be conditional to a priori subscription or granted by entering a specific code or by access through an online shopping area.

46.   More in general, the product information made available through the link should be free of any marketing and promotional information. In addition, the entity responsible for the information disclosure should not collect, analyse or sell any personally identifiable information about consumers or their devices.

Steps to access the information

47.   The online information should be easily accessible: either via a direct link from the product packaging (such as scanning a QR code), or via an intuitive and short search process on the relevant web site, with the smallest possible number of 'clicks', intuitively and following a clearly discernible path. In case of the latter, the following steps are recommended:

- (1) The Internet address stated on the packaging should lead to a site where the relevant product category can be clearly identified.

- (2) Under the heading of the relevant product category, there should be a reference to "safety / ingredients information", or a comparable term which leads to the product selection.

- (3) Ideally, from here no more than 1 or 2 further steps (clicks) should be needed for the final selection of the product sought.

To note:

- Step 1 should lead to a site in the respective national language, ensuring that consumers reliably understand the further course of action/navigation. As an alternative, the welcome page/homepage could offer a navigation aid leading to the respective national language, e.g. in the form of graphic symbols like national flags. Here, the official website of the European Commission (http://ec.europa.eu/) could be taken as the accepted standard, as it offers at one glance all available languages in their national name/spelling/alphabet.

- At the latest in step 2, keywords should be used that allow a clear identification of the path to be followed (e.g. safety, hazard information, ingredients, warning).

- If more than one Internet address is stated on the product label, it should be ensured that the keyword – as given under step 2 – can be easily reached via all of these addresses or that the site relevant for regulatory information is identified on the label by way of suitable measures.

Chapter 7 Principles for the digitalisation of chemical hazard communication - Main findings of available research

"Better Regulation & Safe Use" Consumer Research (Baert et al., 2017) see UN/SCEGHS/35/INF.14 "Hands-on experience with GHS Eye hazard classification for consumer products: challenges and opportunities

48.   This study focuses on the effectiveness of the safety labels of daily used consumer products, specifically detergents. Quantitative on-line consumer research (1800 respondents, four European countries) assessed whether the safety message is noticed and understood, as well as consumer preference, for three label executions: the current approach according to the EU regulatory requirements (CLP and Detergent Regulation); a more graphical alternative with icons replacing precautionary phrases and with an international ingredient list similar to cosmetics; and a highly simplified alternative limited to prominent safe use icons and allergen names, conveying only the safety advice judged most essential by safety experts. Whereas most respondents claimed to read and understand the labels when they first buy or use a product, the study showed that in reality they spend insufficient time to read the content, especially for the more information-rich executions. No meaningful differences between the three label designs were observed in how well the safe use information was

conveyed: specific safety instructions on the label were always recalled rather poorly. Nevertheless, independent of the label design, a large majority was aware of the key safety requirements - i.e. to always store the product away from children, and in case of eye exposure to rinse with water. Ingredients information was neither better retained nor understood on the labels with an ingredient list versus the label without on-pack ingredient disclosure.

49.   In accordance with previous qualitative research, the findings with the different label executions indicate that consumers rely more on prior knowledge, experience and hazard perception to determine how to safely use a detergent product, rather than on the back label. Respondents preferred the simpler and more graphical alternatives versus the current CLP/Detergents Regulation label, which is in line with the earlier qualitative observations that consumers dislike crowded labels with a lot of text

50.   _Implication: These findings show that consumers prefer simple and graphical labels, that the presence of a lot of text does not lead to a better noticing or comprehension of the safety message, and that ingredient information on the label is generally neither read nor understood. Providing the detailed information on line instead of on pack would enable the on-pack label to be limited to the essentials, in a graphical way, which is expected to lead to a better consumer experience and potentially to higher engagement. Furthermore, for the subgroup of consumers with an interest in detail, on line information can help address comprehension barriers e.g. by including layman descriptions of the different ingredients' function rather than only the chemical nomenclature._

Hazard Communication: A Review of the Science Underpinning the Art of Communication for Health and Safety (OSHA, 1997 and 2007)

51.   This report reviews key elements of chemical hazard communication programs: labelling, warnings, material safety data sheets, and worker training - with specific focus on scientific findings on comprehensibility, readability, and other human factors regarding the use of labels, warning placards, and safety data sheets.

52.   A key finding is that in general, the validity and ultimate safety consequences of labelling alternatives are poorly understood. To assess this, behavioural studies are preferable to preference data, but these are rarely conducted. Despite these limitations the following observations are reported that are of relevance in the context of digitalization of chemical hazard information:

-    Perceived hazard, familiarity with a product, and gender influence the consumer's decision to look for a warning message on the labels of potentially hazardous household products.

-    Warnings in outline form and organized by type of hazard are more effective than full text paragraph layouts.

-    Warnings containing visual cues (a pictorial, colour, or an icon) elicited significantly faster response times among subjects than warnings without them.

-    Widely encountered guidelines that warnings should comprise four elements (signal word; hazard statements; potential consequences; how to avoid the hazard) are primarily based on preference studies and may be in error to suggest that all of this information must be provided in order to elicit the appropriate response.

53.   Specifically, it is mentioned that most users of a product will not read the warning information because of a well documented "filtering" process, that is affected by:

- Information overload: warning lists frequently include too many items; contents of single warnings are too extensive; too many individual warnings placed in the field of view; and presence of other non-warning stimuli.

- Faulty risk assessment: the amount of risk information provided does not significantly influence the subjective rating of hazard perceived.

- Benign experience versus a warning: regular exposure to a warning while this hazard in practice did not cause injury.

54.   Implication: This report shows that capturing consumer attention to safety warning labels is challenging - and that to meet this objective, the information should be structured, without overload, and with visual cues. Providing the detailed information on line instead of on pack would enable reducing content on currently too extensive labels, and putting more emphasis on visual elements instead of text where possible.

EU ECHA - Risk communication network

55.   ECHA's Risk communication network conducted a study on the communication of safety information to the general public (ECHA, 2012). Important findings were that hazard and risk perceptions are not rational processes, but that risk-related behaviour of individuals is determined by emotion and mental shortcuts, as well as by experience. Consequently, the communication of hazard-related information needs to acknowledge and make best use of these relevant perception drivers. Against a background of little knowledge of chemical products and time pressure in decision-making, most consumers will rely on superficial and quick assessments, making use of visual cues available on the product ("minimal effort"). In line with this observation, hazard pictograms were found to be more intuitively indicative of a hazard and, hence, have the largest effect on risk perception. The study also concludes that raising awareness is needed - and a website to promote a better understanding of the CLP / GHS hazard pictograms is suggested.

56.   *Implication: This research indicates that consumers' risk perception and safe use behaviour is generally not driven by label elements, and for a label to be more effective at catching attention it should make use of pictograms. Providing detailed hazard and precautionary information online instead of on-pack could allow making on-pack pictograms more prominent.*

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