LIFE Fit for REACH

Seminar on indicators to measure improvement in chemicals management

28-29 November 2019 in VILNIUS, Lithuania

Organised by LIFE Fit for REACH

Report

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Participants:
Over 50 participants from various stakeholder groups, such as researchers / project implementers, scientists, consultants, policy makers (EU COM, MS), LIFE programme officer/EASME, ECHA, and NGOs participated in the event.

Agenda

- Agenda is included (see Annex n°1)

Goal of the seminar:

- To contribute to the further development of ***guidance for (LIFE) projects to optimise their performance indicators;***
- To initiate discussions on how member states could ***expand and/or harmonise their data collection*** to support monitoring the implementation of chemicals-related policies at national and EU level;
- To present ***ideas*** and exchange ***experience on measuring success*** of chemicals risk management in terms of changes in:
    - Behaviour and awareness;
    - The implementation of environmental emission reduction measures;
    - The application and design of governance tools;
    - The socio-economic aspects affected by the use and emissions of hazardous chemicals.
- To ***identify and discuss potential indicators*** for the four areas.

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The event had a character of a workshop, i.e. only a few introductory presentations were given an the majority of time was used for discussions in working groups and plenary. The plenary presentations at the beginning of the seminar introduced to the issue of indicators, and provided examples of different types of indicators. A background paper was provided to the participants prior to the meeting.

Introduction to the meeting

Ms. **Heidrun Fammler**, BEF, welcomed the participants and gave an overview about the seminar. She informed that at the time where the LIFE Fit for REACH project has been applied for (2014) a comprehensive set of project monitoring actions had been requested by LIFE for the first time: projects should monitor their impacts on the environmental problem defined, the impact of their actions to the local economy and to the awareness and behaviour of the target groups. These requirements initiated discussions on what are the "best" indicators. Ms Fammler welcomed the seminar on indicators as an opportunity to share the ideas and experiences on indicators. She invited for comprehensive discussions and hoped for conclusions on "how to measure" chemicals risk management success.

Ms. **Antonia Reihlen**, Oekopol GmbH (Germany), continued with an introduction on options to measure chemicals risk management success. She highlighted the challenge for a particular chemicals risk management activity and its specific aim(s) to identify the best indicators that best reflect if the measure actually leads to the desired goal? „Best" indicators would not necessarily mean "only" showing achievement of goals (i.e. "analytically sound"), but would also imply that data can be obtained and that they are unambiguous and understandable. Cause-effect chains in chemicals risk management were highlighted as helping to frame thinking on the reasons to use indicators, the types of indicators, and where in those chains an effect or impact can be measured.

Chemicals risk management activity	*E.g. an effect on:* *- A process or product, e.g. chemicals content, emission level* *- Information and methods, e.g. tool availability, data generation and publication* *- An actor or institution, e.g. regarding its knowledge base, awareness, competences, resources*	*- Health and environmental impact* *- Socio-economic situation* *- Awareness and behaviour / mind-set of actors* *- Governance, availability of tools and information*

Examples of indicator sets introduced by various presenters

Mr. **Andreas Ahrens**, European Chemicals Agency (ECHA), gave an overview about the ***Policy success indicators*** for ECHA's work under REACH.
Achieving the goals of REACH, which include ensuring a high level of protection of human health and the environment, starts with the generation of knowledge on substance hazards and use patterns and ends potentially with specific risk management measures to prevent adverse effects on human health and environment. Success or failure can be measured at each point of the various cause-effect chains. However, the more distant the measuring point is from the actual activity, e.g. generating information, the bigger is the uncertainty about the relation between cause and impact/effect. Mr. Ahrens stated

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that ECHA does not measure the impact of any of its outputs on human health and environment because this would be too complex, too uncertain and with too much delay.
Instead, ECHA measures the direct regulatory output of its work, the increase in accessible knowledge about the properties of the chemicals in the market (basis for changes in use), the decrease in uncertainty for which chemicals regulatory action is needed, and the efficiency of their screening processes. At the same time ECHA tries to develop indicators to measure how the safety communication in the supply chain improves, and how market volumes and use patterns change as result of regulatory action.

Mr. **Arne Jamtrot** from the City of Stockholm Environmental & Health Administration, representing the NonHazCity INTERREG, concentrated on Chemicals Action Plan. It is a kind of ***governance tool***, for which different indicators have been used to evaluate how the measures it prescribes have been implemented, and how successful these measures have been in reaching Plan's objective, i.e. a non-toxic Stockholm. He explained that monitoring of the successful implementation of the Chemicals Action Plan for the City of Stockholm focused on measuring whether or not awareness, attitude and behaviour were changed due to the implemented activities, and whether or not these activities reduced the use of hazardous substances in the city's entities as well as the occurrence of such substances in in-door and out-door environments. He critically reflected on deducing behaviour change from changed awareness levels and attitudes and acknowledged that it is difficult to relate changes in the concentrations of HS in environmental media and/or exposure decrease to a changed behaviour in the purchasing departments of Stockholm. Finally generating data for monitoring progress was regarded as a challenge, because information is not always accessible, including from safety data sheets in the product used/purchased. He concluded that the data collection methods partly determine the measurement result and would therefore have to be selected carefully and in relation to the intended indicator.

Ms. **Jolita Kruopiene**, Kaunas University of Technology, introduced the LIFE Fit For REACH project indicators to measure ***environmental impact*** from substitution of hazardous substances and other emission reduction measures. The project uses a set of indicators:

- Change in/elimination of emissions of target substances;
- Avoided use amounts of substituted target substances;
- Change in risk (characterisation ratio for human health and the environment);
- Change in environmental impact by LCA categories.

Emissions estimation, a simplified chemicals risk assessment (RA) and Life Cycle Assessment (LCA) methods are used to assess the indicators in order to get a complete picture of impacts (cf. indicator concept of the LIFE Fit for REACH project). As LCAs only insufficiently cover change in chemicals risks and chemical risk assessments do not consider other environmental impacts than (eco-)toxic ones, the two approaches are used in a complementary way.
The defined indicators represent Pressure, State/ Impact, and Response stages of the "driving force – pressure – state - response framework" (DPSR). They cover various stages of the life cycle: from manufacture / production of the input materials until the waste treatment. The concept allows assessing different possible alternatives to substitute hazardous substances, ranging from drop-in solutions to technology changes.

Ms. **Daiva Semeniene**, Environmental Policy Centre (AAPC, Lithuania), representing the LIFE Fit for REACH project, concentrated on the assessment of ***socio-economic impacts***. The Socio-Economic Analysis (SEA) is a well-established method of weighing up the pros and cons of an action for society

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as a whole. If socio-economic benefits of a chemicals risk management measure outweigh the related costs, an action is regarded as "good" for society. Benefits include financial benefits for companies as well as socio-economic benefits for society, such as improvement in the state of human health and the environment and related savings in e.g. public health cost spending or remediation of environmental damage. The assessment of benefits for human health and the environment is difficult both because the quantification of the actual effects is challenging as well as obtaining reliable monetisation of the identified effects (on human health and environment). Therefore, in addition to monetised benefits a qualitative description of potential benefits to ecosystem services and humans triggered by substitution or chemicals risk management in general is very important.

Ms. **Susana Fonseca**, ZERO-Portugal, presented indicators used in the projects LIFE AskREACH and LIFE Fit for REACH to measure ***behaviour change*** and focussed on discussing the challenges in obtaining objective and reliable information. Here, the methodology of information collection is decisive: After formulating questions about the behaviour of the target group that should be evaluated, information can be directly gathered from the stakeholders, e.g. by interviewing them or via online surveys. The baseline situation can/should be described using the same method as applied for the later collection of data for indicator development. In addition, results from other studies, such as Eurobarometer can be used. Behaviour change could also be evaluated by measuring the effects, e.g. if purchasing behaviour should be changed, the respective changes in market shares of products could be measured. However, here it is difficult to relate the observed change to the behaviour of a specific target group and the cause of the changed behaviour.
Currently assessments at both projects are going on. Their results will be used to understand behaviour of customers and companies.

Working groups on identification and characterisation of project indicators

The aim of the working groups was to discuss the idea of indicators to measure the success of chemicals risk management activities using specific examples. A methodology was proposed for use in the working groups involving a description of the relevant cause-effect chains of the project, i.e. describing the main chemical risk management activities and their intended effects and impacts. Based on this, possible indicators were identified and partly elaborated with regard to:

- Point where to measure in the cause-effect chain;
- Type of data needed to derive indicator value and how that data can be obtained;
- Time scale when possible changes would become obvious in the cause-effect chain or as contribution to the ultimate impact;
- Coverage of different types of indicators (human health and environment; socio-economic impact; awareness and behaviour; governance and tools) and their interlinks.

In total 5 LIFE projects were chosen to serve as examples, and their representatives kindly agreed to participate and join the discussion on indicators.
A detailed description of the working groups as well as results of the working groups discussions are given in Annex 2.

Working groups on indicator types

Working groups were structured according to the possible impact areas of chemicals risk management activities, e.g. state of human health and the environment, awareness and behaviour etc. The purpose was to compile key issues and identify potential "standard indicator types", which could be applied for different projects. Discussions included the indicators' ability to reflect effects of various chemicals risk

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management activities, to data collection aspects. A detailed description of the working groups is given in Annex 3.

Summary and conclusions

As a conclusion to the meeting many participants emphasized that they now better understood the value of indicators in project development and communication. This would make them a useful tool, independent of any needs and evaluation conditions under the LIFE programme.
Mr. Manuel Montero-Ramirez from EASME advised the participants from the perspective of the LIFE programme to focus on the key performance indicators as outlined by the project guidelines. This would ensure the project fits to the requirements and would not make indicator work too complicated. Also because of the LIFE program's traditions, some indicators are regarded useful and necessary for the evaluators to ensure comparability. Participants of the seminar noted that it would be good to think about governance of LIFE projects, to have a separate mechanism to measure interrelations between different projects and to connect projects, targeted at one task, to one system, which uses coherent indicators.

Seminar discussions led to the following conclusions:

- Indicators are useful tool to manage complexity of a project because they support focusing on the targets.
- As indicators should be derived from the goals / targets of the project, and taking target group into account (to whom results will be communicated), there is no standard set of indicators fitting all.
- When developing a project and choosing indicators, one needs to describe how the project will contribute to the safer use of chemicals. Significance of contribution needs to be convincing and supported by data. For that, to show the degree of the contribution on the wide scale, extrapolation methods are needed.
- It is important to distinguish between:
    - project deliverables / achievement as such; and
    - follow-up verification (indicator based) whether expected change has taken place.
- In order to avoid unwanted effects, it is needed to include elements of risk / burden comparison between baseline and alternative situations.
- The set of indicators should be kept simple: that is few, clear indicators is better than numerous complex and complicated ones.
- Nevertheless, different indicators and levels of detail may be useful, e.g. for scientific purposes and/or to better control and adjust the project actions. Thus again we are back to goals of a project and target groups of indicator users.
- Making cause - effect chains explicit helps in many ways: to understand the project better, to consider further actions (i.e. potentially useful additional/complementing activities) to increase impacts, and to develop indicators.
- There are different types of projects that can be distinguished regarding their core CRM activities. Namely the CRM activities and project goals determine which indicators are „naturally fitting" to the project, and for which (other impact areas) it should be considered whether or not, and what indicators are useful.
- The most obvious and easy to measure indicators are those "close" to chemical risk management activity in a cause – effect chain.
- Measuring impacts has high uncertainties, because it is difficult to distinguish between the different factors that have an influence on the indicator.

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- Interesting indicators may require high data collection efforts. It is worth while checking, how else the same effect could be measured.
- It may be useful to also think about indirect benefits to express success of an activity or to give attention to „side effects“

Changed product or process/ use

Immediate effects concern reduced emissions, reduced waste, i.e. “pressure” on environment. These indicators are obvious, but require clear argumentation and justification to show that they would contribute to achieving the ultimate goals of the project (i.e. improved state of the environment, changed behaviour, net socio-economic benefits, etc.)
Impacts occur with much delay, therefore, it is unlikely that changes could be measured during the project. Even more, the resulting human health and environmental situation is due to multi-factor effects, and it is not possible to track to the reason / to prove the relationship.
The core challenge is to estimate the degree of market uptake of the alternative chemical, what is the main determinant of the risk reduction achieved by the project.
LCA can be of use (in case of “industrial” projects). It is needed for comparison and quantification of improvement; thus, the direct benefit can be seen. However, sometimes LCA is difficult or nearly impossible due to methodological problems (e.g. lack of characterisation factors).

Tool/ guidance development

Immediate effects concern effectiveness and efficiency gains, which are supposed to indirectly increase efforts in chemicals risk management. Already measuring the use of the tool may be a challenge, as these are normally provided at the project end and hence, the uptake can only be estimated. Whether or not the availability of tools will actually trigger implementation of CRM is even more difficult to predict. Hence, for this type of indicator it is likely that impacts can hardly be measured. The primary information collection source would be interviews with users to identify the efficiently and effectiveness gains, and estimate potential future use.

Data and information on risks and risk management/ Dissemination of risk and risk management

Immediate effects concern information availability, which is supposed to indirectly encourage behaviour change of various stakeholder groups, consequently reducing the exposure to hazardous substances and have an impact on human health and environment. Although indicators on human health and the environment can be directly measured, there is a high degree of uncertainty on the link to the original project activities, as many factors influence human health and environment.

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Annex no 1

Agenda

Moderation: Heidrun Fammler, Baltic Environmental Forum

Time	Setting	Thematic Focus
14:00	Plenary	Introduction to the meeting (Heidrun Fammler, Baltic Environmental Forum) Introduction to measuring chemicals risk management success (Antonia Reihlen, Oekopol GmbH, Germany – consultant to LIFE Fit for REACH)
14:20	Plenary Presentations	Introduction to different types of indicators • Policy success indicators of REACH (Indicators used by ECHA) → Andreas Ahrens, ECHA • Governance tools: Chemicals Action Plan of the city of Stockholm → Arne Jamtrott, Stockholm, NonHazCity INTERREG • Environmental impacts from emission reduction measures: Jolita Kruopiene, Kaunas technical University, LIFE-FitForREACH, • Socio-economic impacts: Daiva Semeniene, Env. Policy Centre, Lithuania, Fit for REACH • Changes in Awareness and Behaviour of consumers and companies: Susana Fonseca, ZERO-Portugal, LIFE-AskREACH, LIFE Fit for REACH
15:30	Discussion	Reflection on presentations
15:50		Introduction to the group work (Antonia Reihlen)
16:00	Coffee break	
16:30	Working groups 1.5 hrs 5 groups Facilitators: 1. Jolita Kruopiene 2. Jana Simanovska 3. Antonia Reihlen 4. Ingrida Bremere 5. Audrone Alijosiute-Paulauskiene	Discussion on the "cause-effect chains" of chemicals risk management activities and their goals. Identification of possibilities to measure the activities' success and elaboration of data needs, time scales and meaning of these indicators. Each groups will be based on a specific example from the following LIFE projects: 1 LIFE GOAST – Massimiliano Silvestri 2 LIFE Green Grapes – Laura Mugnai 3 LIFE MILCH – Paola Palanza 4 LIFE VERMEER – Anna Lombardo 5 LIFE AskREACH – Julian Schenten
18:00	Plenary	Reporting by the facilitation team, link to next day
18:30	End of the day	

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Time	Setting	Thematic Focus
9:00	Plenary	Summary and interim findings from day 1, including review of discussed indicators, data needs and timing of success measurements and focussing of further discussions (Antonia Reihlen)
9:30	4 groups 1.5 hrs Facilitators: 1. Jolita Kruopiene 2. Ingrida Bremere 3. Audrone Alijosiute-Paulauskiene 4. Jana Simanovska	Reflection on indicators assessed as during the first day with regard to their use in the LIFE programme, e.g. with a view to their links to particular project goals and deliverables, the involvement of different stakeholder groups, interpretation of measurement outcomes and their links to the project activities. The working groups will be structured according to indicator types, i.e. indicators to measure 1. Reduction of ((eco-)toxicological) risks and (other) adverse environmental impacts 2. Use and effects of governance tools and policy uptake of recommendations and tools 3. Socio-Economic changes 4. Changes in awareness and behaviour of different actors
11:00	Coffee break	
11:30	Plenary	Reporting from second work session
12:00	Plenary	Feedback from Stakeholders
	Summary and conclusions	EU COM, EASME LIFE Programme officer and N.N. are invited to give a feedback to the meeting results It is expected to pin-point conclusions towards two results of the event: • A contribution of the workshop to the further development of guidance for LIFE projects to develop their indicators according to the four areas (Manuel Montero-Ramirez, EASME LIFE Unit, tbc) • A contribution to the discussion on data generation to form indicators for policy success measuring (Andreas Ahrens, ECHA) • Other stakeholders
13:00		The end

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Annex no 2

Working groups on identification and characterisation of project indicators

Results of the working group discussions

- Making cause - effect chains explicit helps in many ways:
  - understanding the project better,
  - considering further actions (i.e. potentially useful additional/complementing activities) to increase impacts,
  - developing indicators, etc.
- There are different types of projects that can be distinguished regarding their core CRM activities. Namely the CRM activities and project goals determine which indicators are „naturally fitting“ to the project, and for which (other impact areas) it should be considered whether or not, and what indicators are useful.
- Indicator development MUST take purpose and target group into account. Different indicators and levels of detail may be useful: generally, be rather simple and clear than complex and complicated (unless for scientific purposes and/or to better control and adjust the project actions).
- Clear argumentations are necessary to justify why an indicator is valid and the uncertainties related to it:
  - when an indicator is “close to activity” → there is uncertainty about how the effect evolves until the final impact, and
  - when an indicator is “close to impact” → there is uncertainty about the contribution of the project to the change in relation to other influencing factors.

1. Working group “LIFE GOAST”

Mr. Massimiliano Silvestri shortly introduced the project, including its aims, activities, and used indicators:

- Green Organic Agents for Sustainable Tanneries (LIFE GOAST)
  LIFE16 ENV/IT/000416

The main aim of the project is to demonstrate the benefits of a new tanning technology (replacement of chromium salts with less hazardous substances) on a semi-industrial scale: its technical feasibility, as well as the reduced environmental impacts, while producing comparable or better quality leather.

As a result of the presentation and discussions, a scheme of the cause – effect chain was developed:

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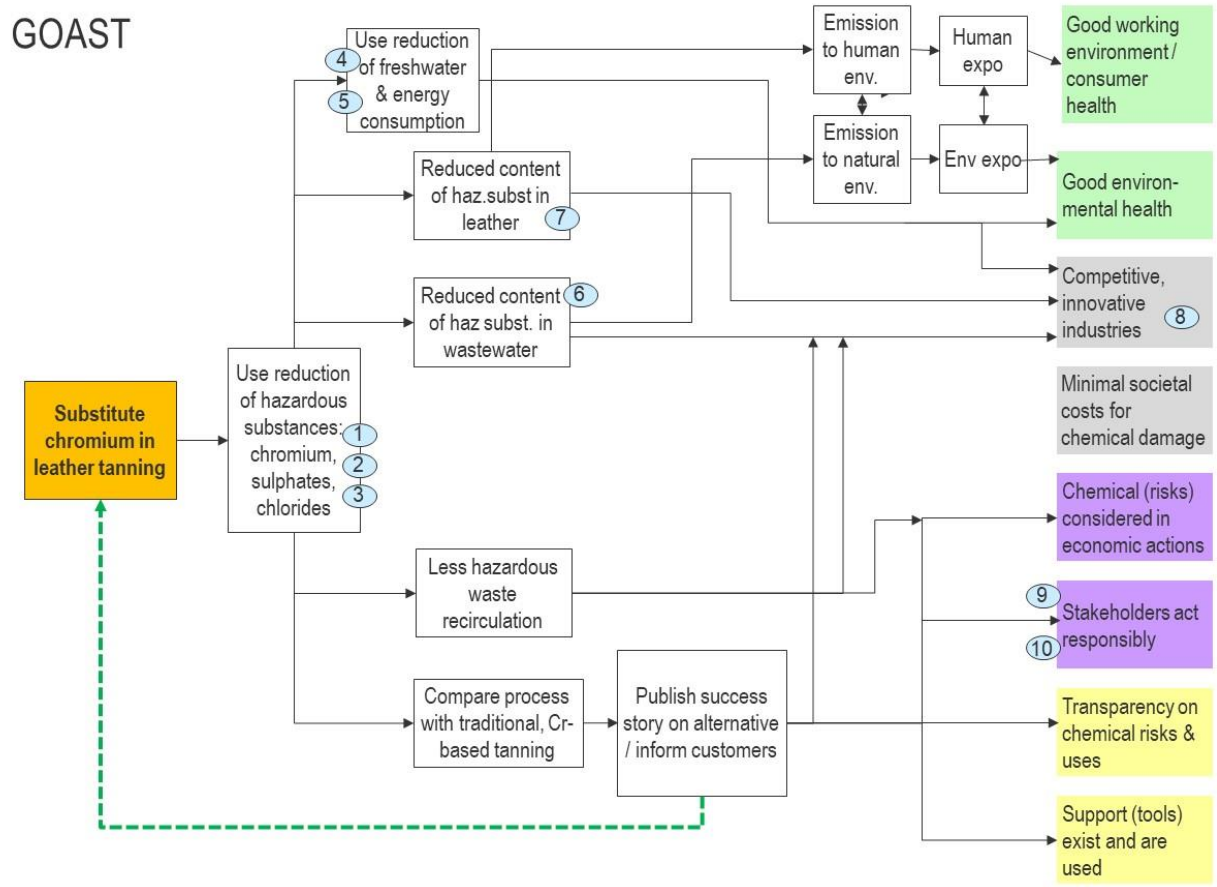

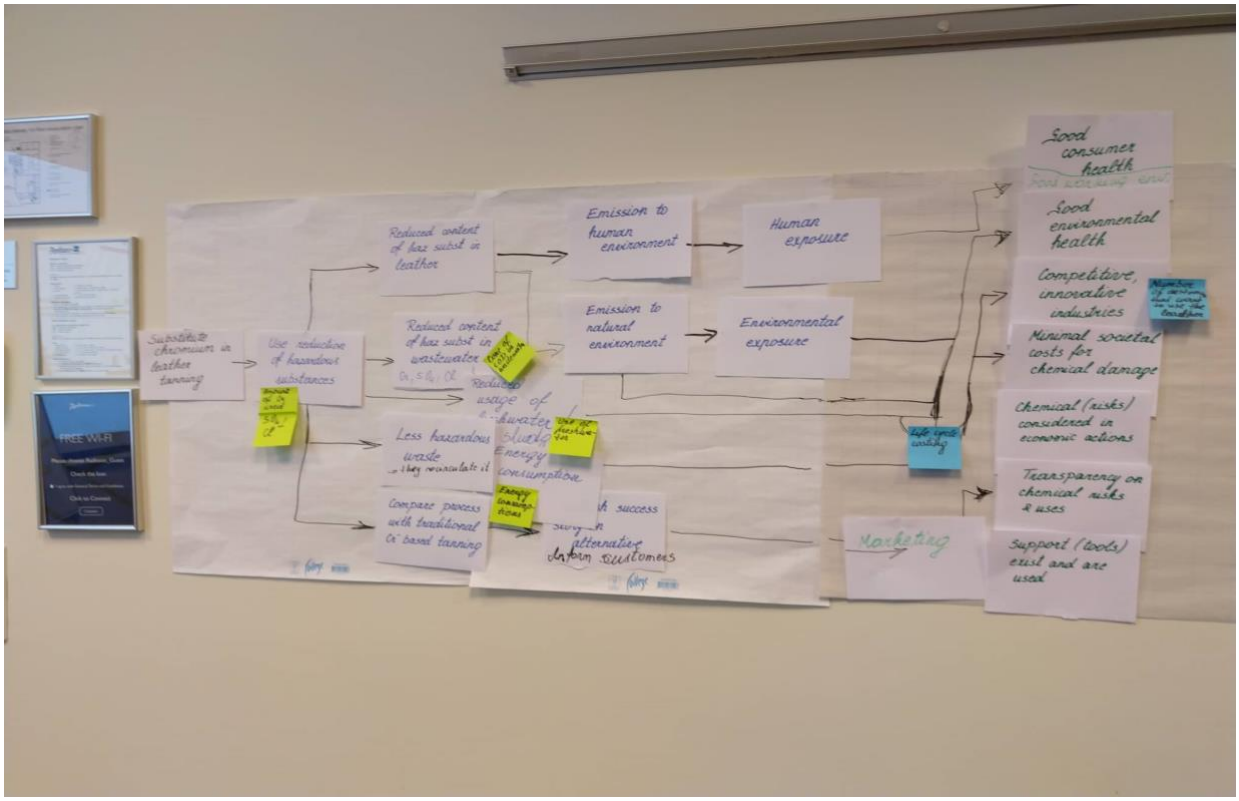

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Working group participants proposed the following indicators and their characteristics:

Indicators gathered from the workshop for LIFE GOAST:

Name of indicator	Type of indicator	#	Data sources	Time of effect	Comments
Substitution of chromium salts	State of human health & environment	1	Company data	Within the project	Simple indicator; kg / t fresh hides
Amount of sulphate used	State of human health & environment	2	Company data	Within the project	Simple indicator: amount of usage reduced; kg / t fresh hides
Amount of chloride used	State of human health & environment	3	Company data	Within the project	Simple indicator: amount of usage reduced; kg / t fresh hides
Water consumption reduction	State of human health & environment	4	Company data	Within the project	Amount of process water saved by introducing GOAST tanning process
Energy consumption	State of human health & environment	5	Company data	Within the project	Reduction of energy consumption is an additional effect of GOAST tanning process
Reduction of Dangerous substances	State of human health & environment	6	Measurements	Within the project	Concentrations of chrome, chlorine, sulphates, COD get reduced in wastewater adopting GOAST tanning process; kg/m3 wastewater
Waste management improvements	State of human health & environment	7	Company data	Within the project	Reduction of amount of leather scraps containing chrome salts (kg for 1000 kg of hide processed)
LCCA – life cycle costing global costs	Socio-economic impacts	8		Within the project	Standard method, but must be done with a particular care; Big data quantity needed
Replication/ transfer: number of companies using the process	Awareness & behaviour	9		At the end and after the project	
Market uptake: Customers that want to use the new leather	Awareness & behaviour	10	Information from involved end customers	At the end and after the project	Can be measured as market size of a number of involved end customers

The chemicals risk management activity is the substitution in leather tanning resulting in less hazardous products and lower hazardous emissions at company level. The core challenge is to estimate the degree of market uptake of the alternative chemical, which is the main determinant of the risk reduction achieved by the project.

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The following aspects were noted by participants of the working group:

- The most obvious and easy to measure indicators are those "close" to chemical risk management activity in a cause – effect chain.
- An exercise of visualisation of cause – effect chain helps to understand the links between project activities and its potential impacts.

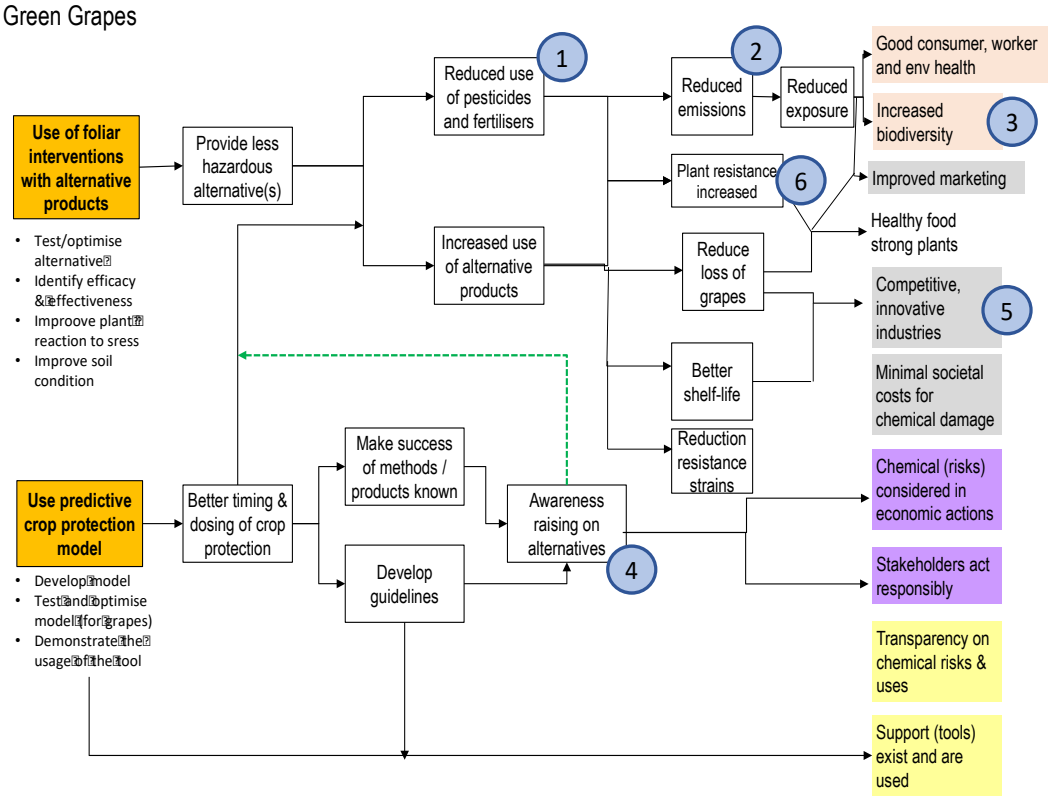
2. Working group LIFE Green Grapes

Ms. Laura Mugnai shortly introduced the project, including its aims, activities, and used indicators:

- New approaches for protection in a modern sustainable viticulture: from nursery to harvesting (LIFE GREEN GRAPES)
  LIFE16 ENV/IT/000566

The main objective of the project is to improve the anti-parasitic response of vineyards through the use of innovative natural products and to increase the biodiversity associated with vineyards. It aims to demonstrate the effectiveness of predictive crop protection models, coupled with agronomic techniques and foliar interventions on vine plants, based on the use of products to increase plant resistance and biocontrol agents.

As a result of the presentation and discussions, a scheme of the cause – effect chain was developed:



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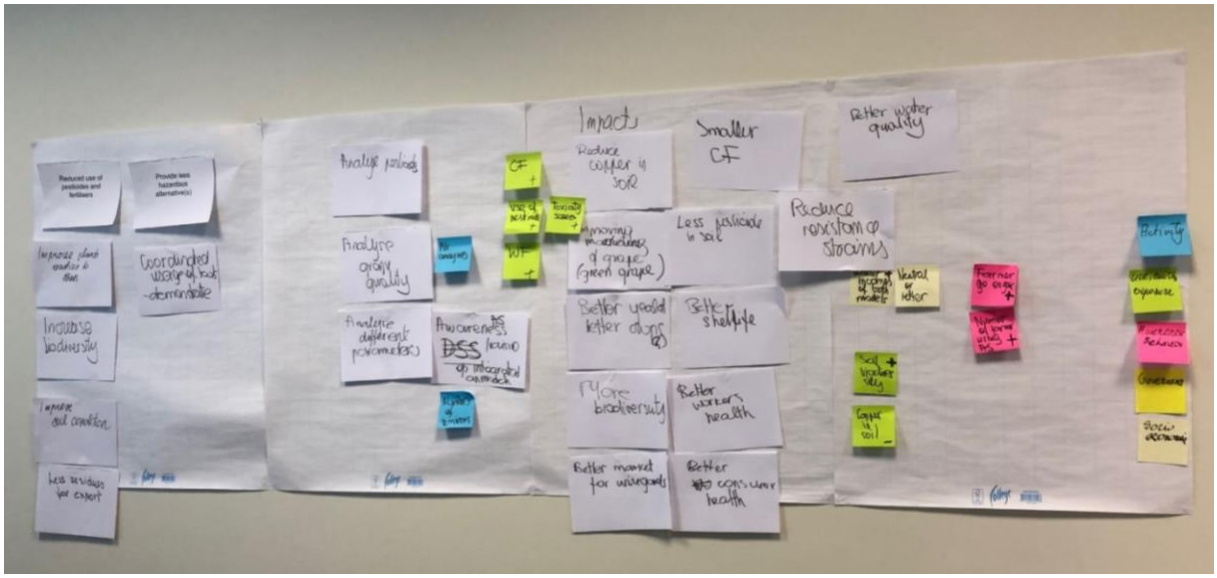

As presented by Laura Mugnai, the key indicators used in the project were:

- Reduction of greenhouse gas emissions (GHG), other GHG (CO2+CH4+N2O);
- Reduction and/or substitution of dangerous substances (Irritant, Corrosive, Toxic, Persistent, Bioaccumulative);
- Reduced water consumption;
- Areas of agricultural land under sustainable management;
- Soil surface improved;
- Habitats/Areas progressing towards improvement or restoration or in a favourable conservation status.

Working group participants discussed which other types of indicators could be used identified the following indicators as possible:

Indicators gathered from the workshop for LIFE GREEN GRAPES

Name of indicator	Type of indicator	#	Data sources	Time of effect	Comments
Chemical tests of grape quality	State of human health & environment	1	Laboratory tests	Within the project	
Water footprint	State of human health & environment	2	Calculations before and after application of alternative methods	Within the project	
Carbon footprint	State of human health & environment	2	Calculations before and after application of alternative methods	Within the project	
Amount of pesticides applied (or harmonised risk indicators)	State of human health & environment	1	Laboratory tests; calculations	Within the project	

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Name of indicator	Type of indicator	#	Data sources	Time of effect	Comments
Soil biodiversity	State of human health & environment	3	Laboratory tests	To some extent within the project and maybe after	Measurements of biodiversity of microbiome and micro-arthropods in the soil.
Copper in soil	State of human health & environment	2	Laboratory tests	Within the project	
Number of farmers moving to organic farming	Awareness and behaviour	4	Measurements	Within the project	
Cost/incomes for farmers for both models (comparing conventional and alternative farming)	Socio-economic impacts	5	Questionnaires, surveys	Within the project	Are the incomes the same or higher? Shelf life might be one of the parameters.
Number of seminars	Activity	4			
Number of farmers using alternative system	Awareness and behaviour	4	Measurement	Within the project	
Better shelf-life	Socio-economic impacts	6	Questionnaires, surveys	Within the project and after	
Lower pressure on farmers health (toxicity scores) Was not agreed among all participants since pesticides that harm workers health should be on the market.	State of human health & environment	2	Calculations	Within the project	By using less toxic chemicals

The following aspects were noted by participants of the working group:

- The participants discussed mostly those indicators for which information is available and which would express a direct project success.
- An interesting indicator would be the state of workers health. This would require deriving a baseline on respiratory irritation and skin diseases and measuring e.g. after 10 years of using the alternative methods. However, it is challenging to exclude other factors that contribute to these endpoints. Data collection would be cumbersome and it may be easier to simply describe the change in toxicity. The EU Harmonised risk indicators could be used for it.
- The length of the products' shelf-lives indicates the quality of the harvest. This could be another indicator to evaluate the alternative method.

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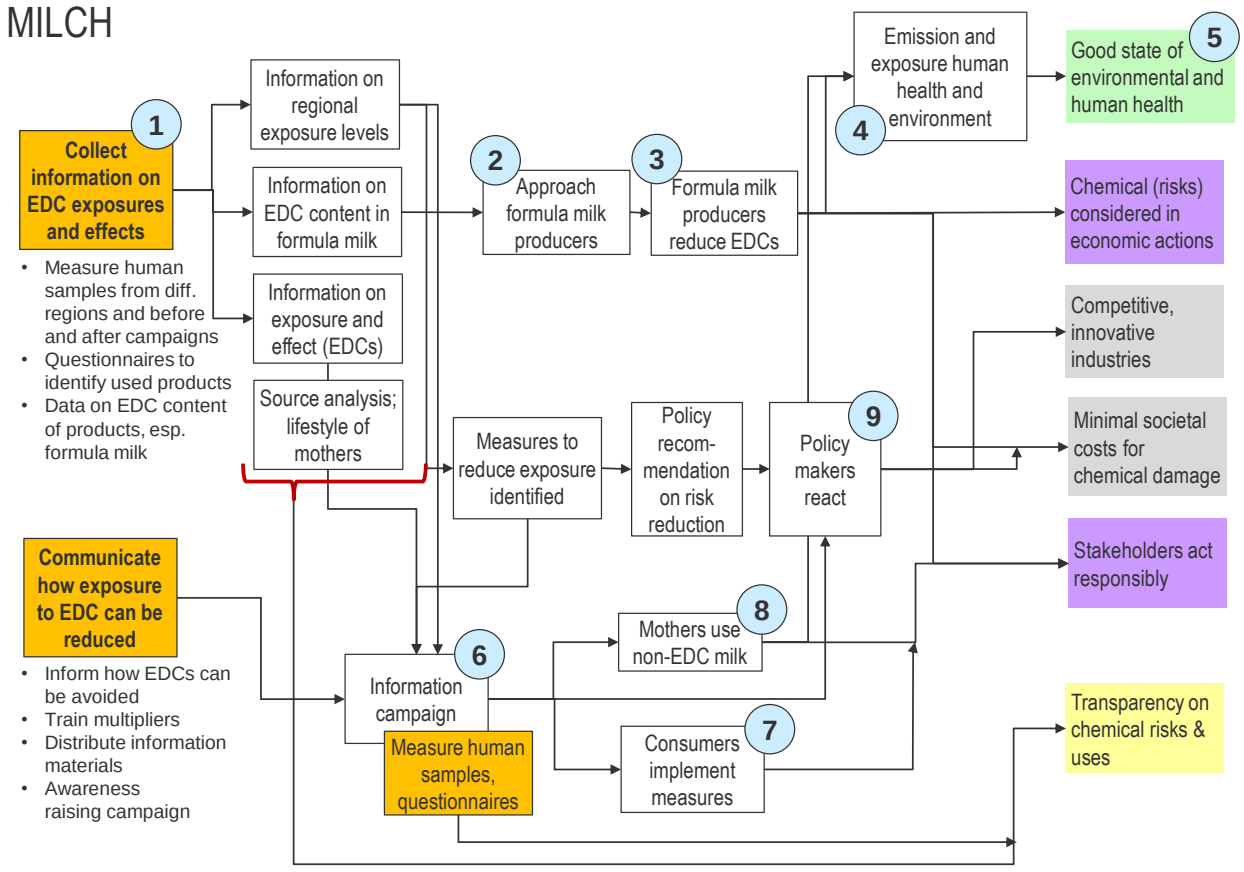
3. Working group LIFE MILCH

Ms. Paola Palanza shortly introduced the project, including its aims, activities, and used indicators:

- Mother and Infant dyads: Lowering the impact of endocrine disrupting Chemicals in milk for a Healthy Life (LIFE MILCH)
  LIFE18 ENV/IT/000460

The project aims to improve knowledge about the correlation between levels of maternal exposure to EDCs/milk contamination and the health status of infants, in order to support public health policies. A second core aim is awareness raising, in particular among pregnant women, on the occurrence of EDCs in consumer products and how exposure could be reduced to protect the unborn life.

As a result of the presentation and discussions, a scheme of the cause – effect chain in LIFE MILCH was developed. Two indicators were introduced by Paola Palanza that should be measured after the project end: EDC exposure levels (further biomonitoring) and change of awareness (continuation of awareness raising campaigns). These are not included in the scheme.



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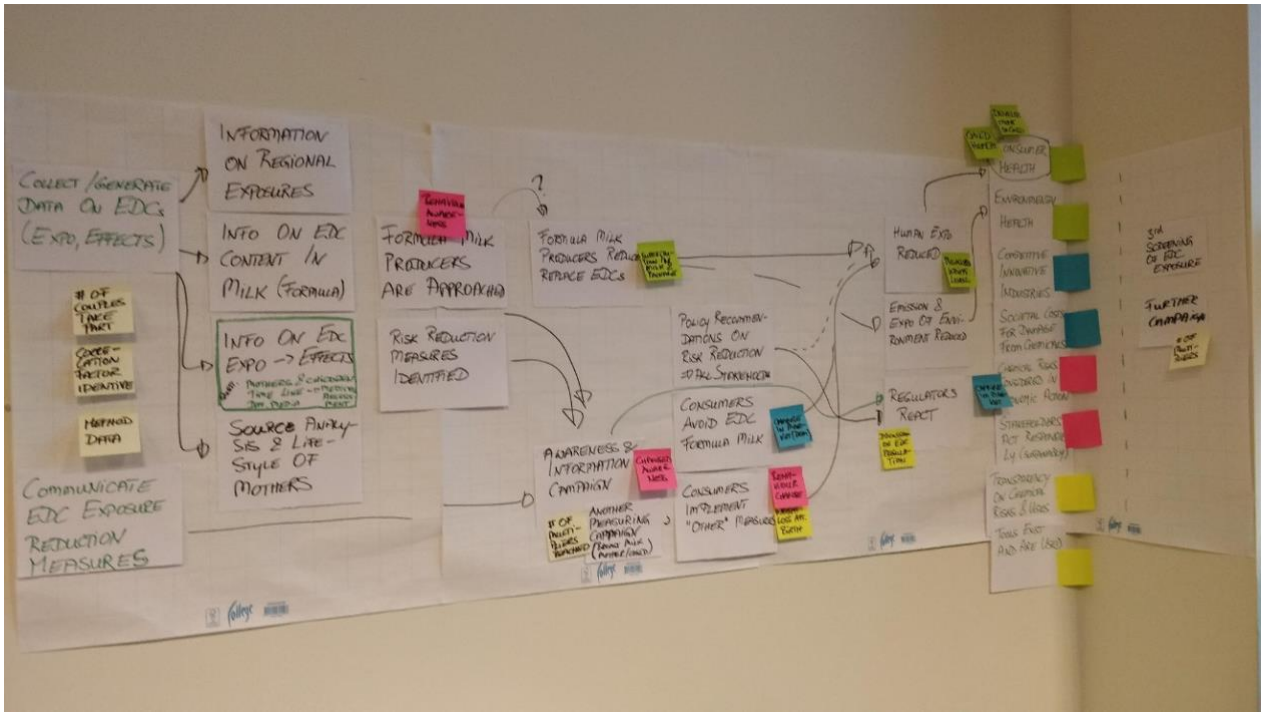

The following table contains indicators used by the project team as well as additional suggestions how project success could be measured, including additional benefits from the project activities.

Indicators gathered from the workshop for LIFE MILCH:

Name of indicator	Type of indicator	#	Data sources	Time of effect	Comments
Couples of mothers and babies participating	Activity	1	Project activity	Within the project	May inform about the statistical relevance and the increase in transparency/ data from the project
Health of the baby	State of health & environment	5	Medical examinations of baby, specific project activity	Within and after the project (late adverse effects)	Several factors may influence the health of the baby other than the EDCs taken up
Development of the baby	State of health & environment	5	Medical examinations/ observations of baby, specific project activity	Within and after the project	Several factors may influence the development of the baby other than the EDCs taken up
Measured EDC levels in mothers and children	State of health & environment	4	Taking samples from milk, urine etc., lab tests, specific project activity	Within and after the project	Despite source analysis, unclear where EDCs originate from
Correlation factor between exposure of mothers and effects in children	Activity	4/ 5	Processing exposure and impact data, specific project activity	Within and after the project	Unclear if correlation can be demonstrated, open research

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Name of indicator	Type of indicator	#	Data sources	Time of effect	Comments
Measured concentrations of EDCs in formula milk	State of health & environment	3	Discussions, sampling, lab tests, specific project activity	Within and after the project	Sampling unclear, potentially milk used by mothers
Substitution of EDCs in formula milk	State of health & environment	3	Lab tests, questionnaires	Maybe during the project, rather later	Substitution only a side strand of project
Consumption pattern of mothers (before and after the campaigns)	Awareness and behaviour	6	Questionnaire(s) at several times, specific project activity	During and after the project	Lifestyle analysis at the beginning, also basis for recommendations
Awareness of the EDC (producers, mothers, society etc.)	Awareness and behaviour	6	Questionnaire, specific project activity	Within and after the project	Important also to estimate long-term readiness to change
Producer behaviour (willingness to reduce or substitute EDCs)	Awareness and behaviour	2, 3	Questionnaire, specific project activity	Within and after the project	Shows effect of several activities on producer decision making
Market changes (changed supply and demand)	Socio-economic impacts	3, 8	Questionnaires, market survey	After the project	Would be additional activity, challenging as market changes may have many reasons
Mothers' weight loss after the birth (dieting)	Awareness and behaviour	6	Medical examinations, questionnaires	Within and after the project	Weight-loss as important factor why EDCs translocate to milk, easy measured
Discussion on regulation of EDCs	Governance and tools	9	Observing media and national/EU policy discussion and people	Rather after the project end	Could be another incentive to discuss, e.g. in the context of vulnerable groups
Occurrence of the topic EDCs in statements by (local) authorities	Governance and tools	9	Observing authority behaviour and public statements	Within and after the project	Indicator for uptake at national level
Data available on EDC exposures	Activity	1	Compilation and making available data, citations in publications	Within and after the project	Project deliverable
Hospitals are trained to educate mothers about EDCs in a routine basis	Governance and tools	6	Campaigns, seminars, lectures etc.	Within and after the project	Aim to establish structures to integrate awareness raising

The following aspects were noted by participants of the working group:

- The project activities explicitly create data on EDC exposure levels and effects and hence, the indicators on the state of human health and the environment are directly accessible (i.e. testing of human samples, medical observations).

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- The project activities include questionnaires on the awareness levels and use of products by mothers (for their babies); hence also data for awareness and behaviour change in relation to the product use can be directly derived from the project work.
- Indicators on the behaviour change of formula milk producers would be interesting, as it could show how the market reacts and how this might impact on human health and the environment.
- Although the indicators on human health and the environment are directly measured, there is a high degree of uncertainty on the link to the original project activities, as many factors influence the babies' health, other than the EDC consumption with products.
- There are very simple measures to reduce child exposure (i.e. not dieting during breastfeeding time), which can be communicated and are very effective.
- There is high interest in the project and there should also be campaigns for awareness after the project end and measuring of further trends of exposure levels.
- Apart from the socio-economic changes that derive from the health and environmental benefits, few self-standing socio-economic indicators were identified. The changes on the market were one of these, however with limited possibilities to actually implement them in practice.

4. Working group LIFE VERMEER

Ms. Anna Lombardo shortly introduced the project, including its aims, activities, and used indicators:

- Integrating VEGA, toxRead, MERLIN-Expo, and ERICA in a platform for risk assessment and substitution of risky substance (LIFE VERMEER)
  LIFE16 ENV/IT/000167

The project will integrate exposure and hazard assessment into a single advanced tool for risk assessment and for the harmonisation of human and environmental approaches, in particular, for the implementation of the REACH regulation. In addition, the objective of the project is to deliver flexible and user-friendly software tools, called SPHERA, which is a platform that integrates the already existing tools for the exposure and the hazard assessment, providing a single decision making index, and ToxEraser, which will help the user to identify the most suitable chemical substitute to replace risky compounds.

Indicators defined by the project were:
1) use and reduction indicators: reduction of greenhouse gas emissions, reduction and substitution of hazardous substances, improved water quality, employment (jobs created);
2) socio-economic impacts indicators: use of the tools (market uptake), reduction of cost per unit or process (the cost savings that companies might have when using the tools);
3) governance and behaviour change indicators: awareness raising, website visits, behavioural change, availability of computer programmes without charges.

As a result of the presentation and discussions, a scheme of the cause – effect chain in LIFE VERMEER was developed. Using the scheme, different opportunities to measure impacts of the project were discussed. The resulting scheme as well as the proposed indicators and their characteristics see below.

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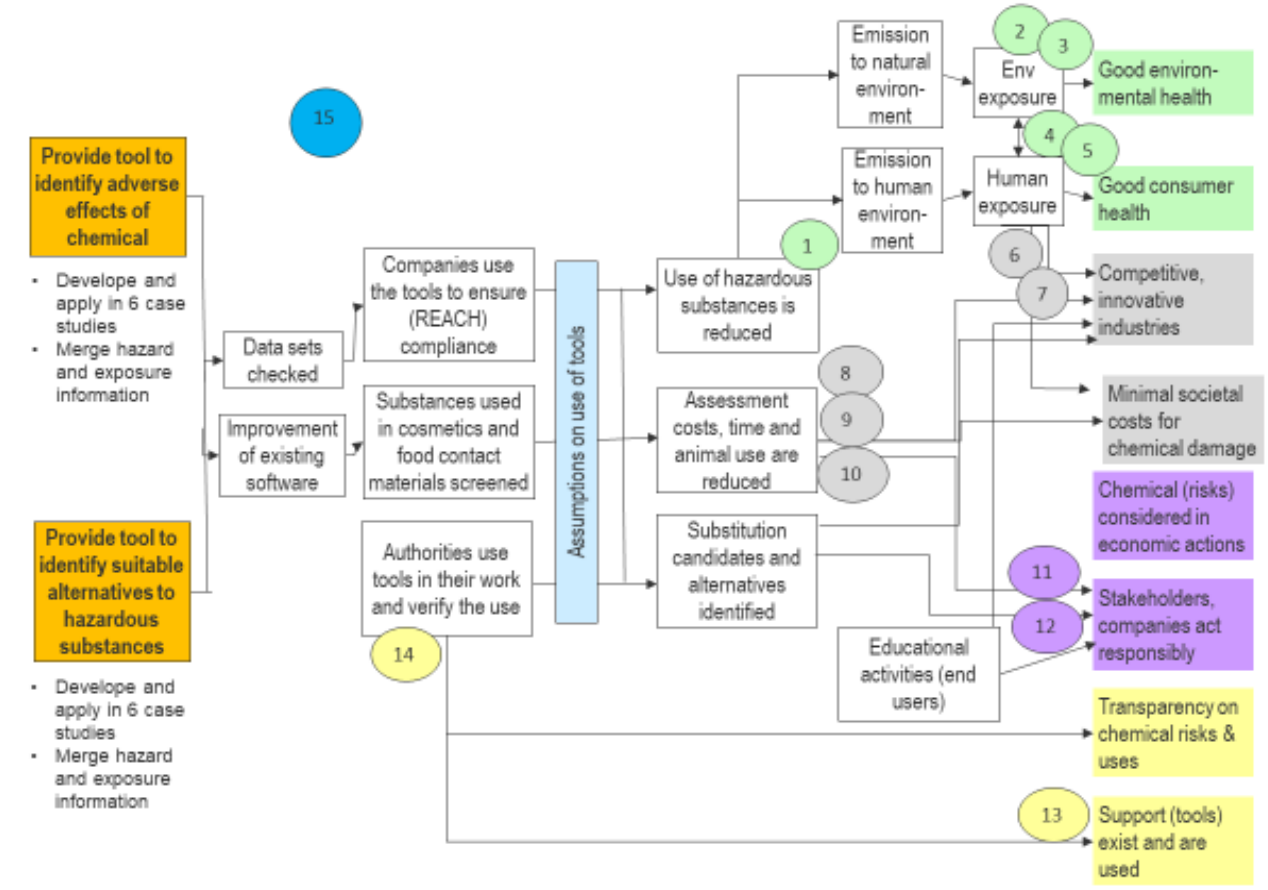

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Indicators gathered from the workshop for LIFE Vermeer:

Name of indicator	Type of indicator	No	Data sources	Time of effect	Comments
Amount of chemicals, solvents in use	Activity	1	Project activities New software tools will reduce the amount of HS in use suggesting suitable substitutes	Within the project	Reduction of amounts of HS (irritant, corrosive, toxic, CMRs, BPTs) in use
Change of emissions of GHG to environment	State of human health & environment	2	Project activities New software tools will reduce the amount of GHG to environment suggesting suitable substitutes	Within and after the project	Reduction of non-methan VOCs of industrial origin through substitution
Change of emissions of chemicals to water	State of human health & environment	3	Project activities	Within and after the project	Fewer pollutants released to water
Changes in risks to workers from reduced exposure	State of human health & environment	4	Project activities	Within and after the project	Reduced health impacts of the chemicals used (substitution)
Changes in risks to consumers from reduced exposure	State of human health & environment	5	Project activities	Within and after the project	Reduced health impacts of the chemicals used (substitution)
Number of companies interested in tools, market uptake	Socio-economic impact	6	Project activities; interviews with industries	Within and after the project	New companies interested in tools
Number of companies benefit from tools and chemicals reduction activities	Socio-economic impact	7	Project activities; interviews with industries	Within and after the project	Better competitive position, reduced costs per unit or process within companies, changes on the market
Costs for the risk assessment of chemicals	Socio-economic impact	8	Project activities; interviews with stakeholders	Within the project	Reduced costs for the risk assessment by using the tools developed
Spent hours for the risk assessment of chemicals	Socio-economic impact	9	Project activities; interviews with stakeholders	Within the project	Reduced time for the risk assessment of chemicals thank to new tools developed
Number of animals used for lab experiments	Socio-economic impact	10	Project activities; interviews with stakeholders	Within the project	Reduced use of animals for laboratory experiments by using the existing

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Name of indicator	Type of indicator	No	Data sources	Time of effect	Comments
					data and new tools developed
Number of companies participated in workshops, trainings and have the know-how about the use of tools	Activity	11	Project activities	Within the project	Companies involved in project activities know how to use the tools, aware about the need for substitution and are able to identify the alternatives
Number of stakeholders (authorities, NGOs) involved in project activities	Activity	12	Project activities	Within the project	Stakeholders involved in project activities verify and use the tools in their work
Level of acceptance/use of tools	Governance and tools	13	Questionnaires, specific project activities	Within and after the project	How the tools used by authorities or companies; feedback from companies and authorities
Number of downloads of tools	Governance and tools	14	Measurement of downloads from webpage	Within and after the project	How many downloads by diferent users, general
Transferability of whole project	Governance and tools; general indicator for the whole project	15	Questionnaires, specific project activities, interviews with stakeholders	Within and after the project	Can tools become a part of the VEGA platform for QSAR models, can they support REACH by identification of risky substances etc.

The following aspects were noted by participants of the working group:

- Almost all effect and impact indicators are based assumptions on the future use of tools. The tools are provided by the project but their real use can be measured only after the project end and when some time has passed to make it known and be established among the companies. It is not clear how many people will download the tool, because they will be freely available also after the project ends.
- The indicators on the reduction of GHG emissions and/or solvent use indicate a potential and this can be modelled by the (tools) by identifying the risky substances (priority substitution candidates) and identifying possible alternative. Howe many of these potential substitutions are then actually implemented can however not be estimated.
- Transferability of all project is important. The tools developed by project could be used by EFSA, they can become a part of the VEGA platform for QSAR models, they can support the implementation of REACH by identification of risky substances and their possible substitutes. The use of tools enables to reduce the number of tests with animals in lab.
- The use of tools could reduce the costs of companies. The project team predicts clear benefits due to facilitated (more efficient and effective) identification of substitution candidates and

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use reduction of hazardous chemicals. This could put them into a better competitive position, and reduce the costs per substitution case.

5. Working group LIFE AskREACH

Mr. Julian Schenten shortly introduced the project, including its aims, activities, and used indicators:

- Enabling REACH consumer information rights on chemicals in articles by IT-tools (LIFE AskREACH)
  LIFE16 GIE/DE/000738

The project aims to raise consumer awareness about SVHCs in articles and enable them to make responsible purchasing decisions by providing a smart phone app that facilitates making SVHC requests according to REACH Art. 33. The project also aims to raise supplier awareness of their obligation to comply with REACH information duties, and improve respective communication and information flows along the supply chains. During the project, a database will be developed which can be filled with information on SVHC in articles by article suppliers. The database will be connected to the smartphone application (app) supporting consumers requests on SVHC in articles.

The discussions in this working group focussed on understanding the project and its different activities and expected results. Specific indicators were not discussed in detail due to time differences.
The indicators presented by the project representative and the discussion of the participants of the working group allowed to draw up the following schemes and the list of key indicators (see table below). In addition, the project will use more available context data (e.g. surveyed consumer purchase behaviour) to assess its impact, also in terms of reduced SVHC exposure.

Indicators gathered from the workshop for LIFE AskREACH

Name of indicator	Type of indicator	Data sources	Time of effect	Comments
Number of consumers reached	Activity	# of request	During the project	It is estimated that 5 mln. users to make 500 mln. requests

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Name of indicator	Type of indicator	Data sources	Time of effect	Comments
Knowledge on SVHC and Art. 33(2) REACH	Awareness & behaviour	Interviews / questionnaire	During the project	Raised awareness on SVHC and on the right to know (art.33) among the consumers
Knowledge and implementation of legal obligations	Awareness & behaviour	Interviews, chemical testing of articles in database	During the project	Companies: increased compliance Art. 33.1 And 33.2. (Project presenter also shared an additional approach/activity related to how pilot companies providing Full Material Disclosure (FMD) could benefit by not having to resubmit declaration when SVHC list is updated
Substitution	Awareness and behaviour	Interviews, change of database entries on SVHC content in articles	During the project	Companies – article suppliers substitute SVHC
Costs for the companies	Socio-economic impact	Interviews, survey of companies registered at the database	During the project	Overall reduced costs for the companies. Project creates cost for companies, but database approach is an effective way to deal with providing information on SVHC. Thus, it is possible that the costs are actually reduced
Numbers of companies using the tool, articles registered	Socio-economic impact (via market uptake)	Database entries	During the project	Number of companies using the tool, articles registered
Number of Staff strained	Socio-economic impact	Staff in participating companies	During the project	Retailer and supply chain staff will be trained to comply with Art. 33.1 and 33.2. and avoid SVHCs in articles
Declining market share for articles with SVHC	Socio-economic impact	Estimates using the database	During the project	Reduced competitiveness of SVHC articles in the market. Project team would like to show how market share changes for articles with SVHC.
Increasing market share for articles without SVHC (above 0.1%)	Socio-economic impact	Estimates using the database	During the project	Non-SVHC article producers benefit from project (market share of SVHC-free articles increases). But majority of articles do not contain SVHC anyway. This is a “high risk” indicator.
Involvement of competent authorities	Governance	Project activities	During the project	Competent authorities get involved, can use knowledge gains in work with companies, enforcement agencies etc.
Enforcement of REACH Art. 33	Governance	Interview	During the project	Action taken towards change of inspection strategy

The following aspects were noted by participants of the working group:

- It was challenging to identify and clearly differentiate between different indicator types and how they were structured in the preparatory documents (activity, effect, impact vs human and

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env. health, socio-economic, behaviour, governance). In addition, the indicators appeared to be so closely related that separation was regarded as difficult.

- As the project scope involves many actors and complex interactions, it would be good to go through the exercise (of identifying the cause-effect chains, and possible indicators and their characteristics) with the whole project team. Receiving insights from other projects was very helpful as well.
- The impact of AskReach is difficult to measure, in particular for health and the environment but also regarding raised awareness. This is partly due to the large target audience which is not directly worked with but only reached via the App.
- During discussions, a lot of attention was put on how to measure the indicators.

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Annex no 3

Working groups on types of indicators

1. Working group : Environment / health indicators

1 Working group: Environment / health indicators

Discussion points:

- Relevance of measuring the impact directly
- Alternatives to measuring the impact directly
- Dealing with situations when alternatives cause different impacts compared to originally used substances
- Determine the potential effect/impact when project outcome triggers others to copy (upscaling)

Relevance of measuring the impact directly

- Determining the endpoints is related to the question: What do we want to achieve in environmental impact and health?
- It is important to note that the resulting human health and environmental situation is due to multi-factor effects. It is not possible to track to the reason / to prove the relationship.
- Impacts occur with much delay, therefore, it is unlikely that changes could be measured during the project.
- Consequently, the group advised not to include impact indicators into success measuring[1].

Alternatives to measuring change on health and the environment
(and other ultimate types of goals)

- To keep indicators as simple as possible it helps to define realistic goals and measurable targets; this could lead to indicators of “pressure”, i.e. emissions (reductions), or reduced waste.
- These indicators require clear argumentation and justification to show that they would contribute to achieving the ultimate goals of the project (i.e. improved state of the environment, changed behaviour, net socio-economic benefits etc.)
- For projects where the chemicals risk management activity is not a changed product or process/ use, but e.g. raising awareness or developing tools, “indirect” indicators could be formed to show environmental impact (or burden on environment).
    - An example: LIFE APEX (monitoring chemicals in Apex predators) aims to facilitate data generation and more use of such (and available) data for decision making. So rather indirect indicators will show environmental impacts.

[1] An exception may be those projects, where monitoring the impacts on health or the environment are part of the projects inherent activities, as is the case for the LIFE MILCH project.

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Dealing with situations when alternatives cause different impacts compared to originally used substances

- Comparison is not always needed. For example, substitution of substances of very high concern is important in itself, no matter what other impacts may occur as a side effect of such substitution.
- LCA can be of use (in case of "industrial" projects). It is a standard tool for LIFE projects. It is needed for comparison and quantification of improvement; thus, the direct benefit can be seen.
- How to compare impact factors, e.g.CO_2 vs water use: which of them is more important?
    - Relevance of categories should be evaluated according to the situation (e.g. location).
    - Projects should set their boundaries (e.g. define which impact categories are important for them) initially
    - This needs to be transparent and open, e.g. for project evaluators to be able to judge.
- Sometimes LCA is difficult or nearly impossible due to methodological problems (e.g. lack of characterisation factors, what is especially relevant for chemical substances, or lack of certain processes). How should we know that projects end up doing better rather than worse?
    - Information on nature of alternative (what is the hazard (and exposure)?) needs to be described. Insufficient information (even in case of information unavailability) would be the turning point if (LIFE) project is viable or not.
- Change in risk – would that be an important indicator?
    - Yes – you try to demonstrate that project changes risks.

Determine the potential effect/impact when project outcome triggers others to copy (upscaling)

- Usually, upscaling is understood as a transfer.
- Prove that transfer / replication will/can happen ⇒ multiply the project results according this ⇒ from this you can estimate – extrapolate the impact.

2. Working group: Governance and tools

Discussion points:

- To get better understanding on what is meant with governance and how governance impact on behaviour of actors
- Measurability and usefulness in general

Better understanding on what is meant with governance and how governance impact on behaviour of actors

What do we mean with the term governance?

Governance means creating structures to deal with environmental problems. These structures themselves may be governance tools or such tools may be developed and applied within it.

- Governance is an overall concept of approaching and dealing with problems in a participatory and (partly) institutionalised way. It is applicable to any topic or type of challenge and at any spatial level (e.g. world, EU, town). For example, The Chemicals Action Plan for Stockholm can be regarded as a governance structure. The governance structure can reflect also any rules

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and routines as well as expert groups or stakeholder dialogue related to the development and implementation of legislation.

- By Governance we create a structure for institutionalising the problem solving approach. Such structure, however, does not necessary deal with ruling and thus does not interfere or contradict to the legislative frame.
- The structure can be implemented either on a basis of already existing setting or by creation of a tailored new structure. They are not contradicting. It is the choice of implementers to select the "best fit" for this structure.
- When the existing setting is utilized, we look for fitting and improving the design to best reflection of the environmental problem to be solved.
- When the new structure is created, it will require efforts for setting up and allocation of time for the start-up phase. For example, a new structure could be the authority (ECHA). Some projects allow for creation of new structures from inside.

How do we understand governance indicators?

Indicators reflect design of the structure itself and efficiency of operation of the designed structure.

- The structure itself is evaluated for existence of such a governance structure that fulfils certain requirements. Usually both, quantitative and qualitative parameters are used. In evaluation of governance it is acceptable to have qualitative indicators and also descriptive indicators; you can't always measure them.
- Efficiency or effectiveness is evaluated for work of the structure. It is estimated on how the structure works for the reflection on environmental problem. For measuring the efficiency of the system we have to take into consideration also links to the behaviour and socio-economic indicators.

Measurability and usefulness in general

How to measure? ⇒ It was discussed, how the level of fitting (requirements) by the structure itself and the efficiency of (governance) structure could be measured/ estimated.

- From the perspective for fulfilment of the requirements the structure itself can be measured by level of fitting and uptake of recognised structures. This can include the development of recognised procedures, e.g., step-by-step instructions for routine operations (Standard Operating Procedure). Another aspect to measure can be proven involvement of stakeholders (policy makers).
- From the perspective of efficiency/effectiveness of the system there can be monitoring measurements set up, e.g., by a clear link to monitoring of implementation of the specified requirements. Important is to measure a change. Implementation or enforcement check can be applied. Another aspect can be to measure interaction between departments, e.g., in implementation of the Chemicals action plan.

3. Working group: Socio-economic indicators

Discussion points:

The discussions were started with the question "If you were a LIFE project evaluator, what indictors would you use to measure a project's socio- economic impacts?"

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Indicators to measure socio- economic impact

The following possible indicators for socio-economic impact of a project / activity were suggested and discussed:

- Effects on health (diseases)
- Employment cost (reduced/increased) for companies
- Quality and price of products in the market
- Number of jobs created
- Compliance of products/strategies now and in the future (regulatory readiness)
- Competitiveness (EU, Global or project segment)
- Uniqueness in the market;
- Recycling costs (municipal, company)
- Spending on waste treatment
- Impact on local/SME business
- Benefits created to environment
- Benefit/cost ratio
- Money saved (unit cost)
- Consumer trust in products
- Trust in environmental performance on the company (to measure perception)
- Consumers who are enabled to make environmental choices

Indicators to measure well-being of a company and society

It is important to distinguish also a project's impact on a company, which implements the project, and on society in general. Thus, indicators to measure well-being on two different levels could be broken down as follows:

Company	Society
Changed unit costs /(direct/indirect)	Decreased No of diseases
Less sick days (lower unit costs)	Less sick days
Lower No of accidents	Lower public health treatment costs
Better conditions of work/OHS	Benefits created to environment
Employment costs lower/higher	Lower environmental spending by a municipality / state
Price lower/higher (cost benefit ratio)	
Companies comply now and more	
New business	
Establishment of dissemination platform	

The quantification of costs and benefits at company level is possible but may require intense data collection prior to the project start as well as after the project end, in particular regarding workers health issues and related costs and savings. Measuring the competitiveness of a company is challenging, as many factors influence it.
Monetisation of environmental and health benefits is even more difficult. It requires good data on the qualitative changes, which partly are a direct link to the changes in state of health and the environment indicators.

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In summary, it was recognised that selection of socio-economic indicator to measure a project's impact is a very complex task, and a lot depends on a specific project.

4. Working group: Awareness and behaviour

Discussion points:

- Challenges in data gathering and interpretation
- Assumed behaviour change
    - Purchasing and use behaviour
    - Function of efforts, benefits and awareness

Challenges in data gathering and interpretation

- A "measurement plan" is needed from the beginning of a project to ensure data collection serves the needs of indicators; this may require professional attention for both the indicator development and the design of data collection strategies and methods.
- The main methodology consists in gathering information from the target group via opinion polls, interviews, surveys, questionnaires before and after an activity.
- Behaviour changes could also be measured by assessing the outcome of the changed behaviour, i.e. if purchasing should be changed, the changed consumption could be observed in the shops or by analysing the products in the consumer homes.
- Other stakeholder groups may reflect changes in the target group (e.g., doctors – patients, consumer awareness – product availability).

Assumed behaviour change

- Work with individuals is insufficient, behaviour change actions need to target groups of persons and/or organisations that represent consumers.
- Make structural changes to minimize efforts and maximize benefits, e.g. re-organise system so, that preferred behaviour is taking less efforts and gains more benefits.
- Findings of behaviour science should be used to design both the project activities and the questions to measure success (personal, mindset change, influencers, storytelling).
- Activities must by precisely targeted, which requires good information about the target group.
- Trend tools momentum e.g. use possibilities offered by the situation, work creatively and quickly.
- To change behaviour of one actor of the system (e.g. behaviour of the patients), work with another actor (e.g. medical doctors, who later influence patients).
- Involve professionals in behaviour psychology or economics etc. (increase your budget).

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