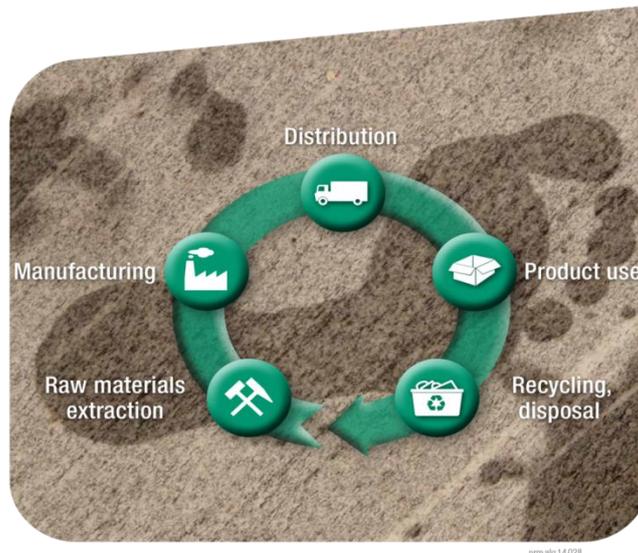


“There is international consensus that the environmental effects of electric vehicles can only be analyzed on the basis of Life Cycle Assessment (LCA) including the production, operation and the end of life treatment of the vehicles in comparison to conventional vehicles”



Environmental Effects of Electric Vehicles (EV)

Water Issues and Benefits of EV-Fleets on Energy Consumption and Air Emissions

Expert Workshop



JOANNEUM
RESEARCH
LIFE



Graz, Austria
January 12 – 13, 2017

JOANNEUM RESEARCH
Leonhardstrasse 56
A-8010 Graz

Local organisers:
JOANNEUM RESEARCH
Gerfried Jungmeier, gerfried.jungmeier@joanneum.at

Introduction

Electric vehicles have the potential to substitute for conventional vehicles to contribute to the sustainable development of the transportation sector worldwide, for example, in the reduction of greenhouse gas (GHG) and particle emissions. There is international consensus that the improvement of the sustainability of electric vehicles can only be analysed on the basis of life cycle assessment (LCA) (Figure 1), which includes the production, operation, and the end-of-life treatment of the vehicles and the fuel cycle. All environmental impacts must include the whole value chain and - if relevant - interactions from recycling in the dismantling phase to the production phase, if recycled material is used to produce new vehicles.

The Implementing Agreement on “Hybrid and Electric Vehicle (HEV)” of the International Energy Agency (IEA) is operating the Task 30 “Assessment of Environmental Effects of Electric Vehicles” to examine the environmental effects of vehicles with an electric drivetrain based on life cycle analyses. The Task 30 started in 2016 and will continue until the end of 2019. The main activities influencing the environmental impacts of electric vehicles on a life cycle basis are:

- 1) Production and life time of the battery,
- 2) Electricity consumption of the vehicle in the operation phase, incl. e.g. energy demand for heating,
- 3) Source of the electricity, only additional renewable electricity maximizes the environmental benefits and
- 4) End of life treatment of the vehicle and its battery.

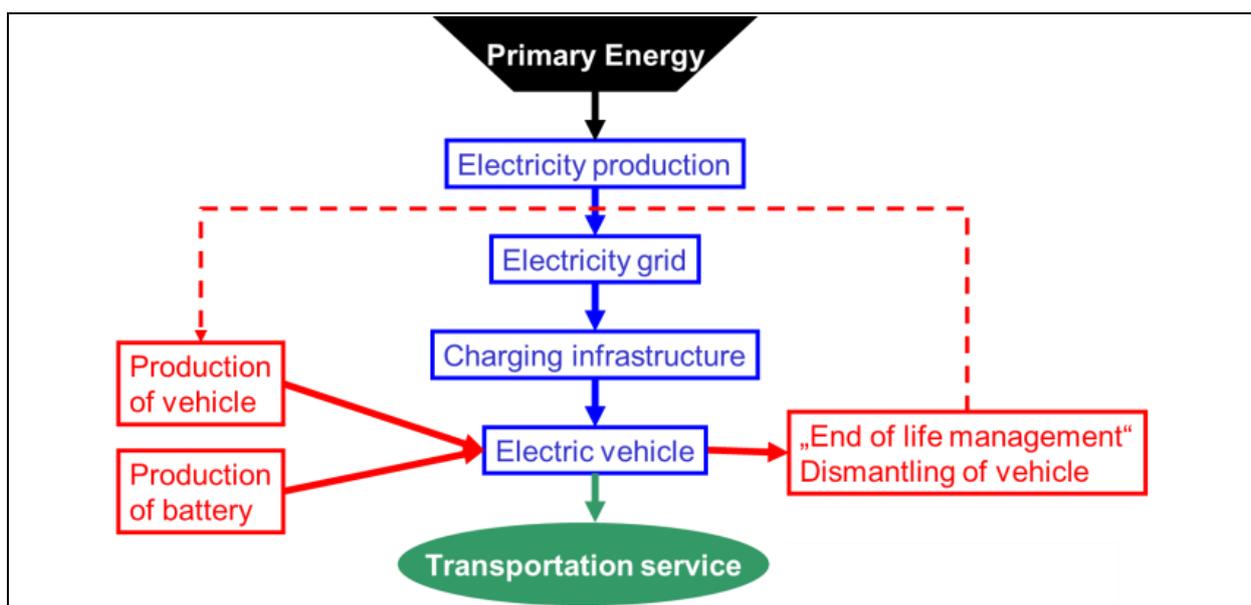


Figure 1: Key elements of the life cycle assessment of vehicles with an electric drive train

Aims of the workshop

The aim of the expert workshop of Task 30 is to analyse and assess environmental effects of electric vehicles (EVs) on water, energy consumption and air emissions based on life cycle assessment in a cooperation of the participating countries in the International Energy Agency (IEA).

The aim of the workshop is to present and discuss the current status and the future perspectives of the environmental performance of Electric Vehicles in comparison to conventional vehicles with an internal combustion engine (ICE) in a life cycle perspective. The main focus is on Battery Electric Vehicles (BEV) and Plug in Hybrid Electric Vehicles (PHEV).

The results of the activities of LCA activities in IEA HEV since 2012 will be presented and recent developments in LCA methodology development and its application to EVs. In a group of relevant stakeholder from government, industry, research and NGOs the relevant issues of effects on water, energy consumption and air emissions will be identified and discussed referring to the ongoing global large scale market introduction of EVs.

The two topics for the workshop are:

1. Water Issues and
2. Benefits of EV-Fleets on Energy Consumption and Air Emissions.

The format of the workshop is based on presentations, discussion and group work with focus on

- Data requirements
- Case studies
- Identification of main issues in LCA of EVs and ICE
- Identification of “hot spots” on water issues of EVs, PHEVs and ICEs
- Communication of LCA results to stakeholders, e.g. Fact Sheet
- Findings and Recommendations

PROGRAMM

Tuesday January 12, 2017

9:30 Welcome

9:45 Introduction - Aims of the Workshop

10:00 – 10:15 IEA HEV Task 30 “**Assessment of Environmental Effects of Electric Vehicles**” (Gerfried Jungmeier, JOANNEUM RESEARCH, A)

Water Issues

10:15 – 11:00 **Water Consumption Factors for Electricity Generation in the United States** (Amgad Elgowainy, Argonne National Laboratory, USA)

11:00 – 11:45 **Addressing Water Consumption and Degradation in LCA – Methodology and Examples** (Laura Scherer, Vrije University Brussels, B)

11:45 – 12:30 Discussion

LUNCH

13:30 – 15:30 **Group work** on identification of key issues of water in LCA of EVs

BREAK

16:00 – 17:00 Presentation and **discussion** of group work

18:30 Typical STYRIAN DINNER

Benefits of EV-Fleets on Energy Consumption and Air Emissions

Friday January 13, 2017

9:00 – 9:30 **LCA of Electric Vehicles – The Experiences in Spain** (Gabriela Beneviste, IREC, ES)

9:30 – 10:00 **An International Dialogue about Electric Vehicle Deployment to Bring Energy and Environmental Benefits through 2030 on a Well-to-Wheels Basis** (Simone Ehrenberger, DLR, D)

10:00 – 10:30 **Country Factsheets on Estimated Environmental Impacts of Current EV-Fleet in 33 Countries** (Gerfried Jungmeier, JOANNEUM RESEARCH, A)

10:30 – 10:45 Discussion

BREAK

11:15 – 12:30 **Group work** on main assumptions and key issues of assessing current and future EV fleets

12:30 – 13:00 Presentation and discussion of group work

13:00 – 13:30 **Summary**, conclusions and next steps

LUNCH

14:00 – 15:30 Task 30 business meeting (members only)

Registration

There is no registration fee for this Workshop.

**Registration for the workshop: via e-mail to gerfried.jungmeier@joanneum.at
Please indicate if you want to participate in the DINNER (€ 50,-)**

For further information please contact

Gerfried Jungmeier
Operating Agent of IEA HEV Task 19 „LCA of EVs“

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Assessment of Environmental Effects of Electric Vehicles

Electric vehicles have the potential to substitute for conventional vehicles to contribute to the sustainable development of the transportation sector worldwide, for example, in the reduction of greenhouse gas (GHG) and particle emissions. There is international consensus that the improvement of the sustainability of electric vehicles can only be analysed on the basis of life cycle assessment (LCA), which includes the production, operation, and the end-of-life treatment of the vehicles and the fuel cycle. All environmental impacts must include the whole value chain and - if relevant - interactions from recycling in the dismantling phase to the production phase, if recycled material is used to produce new vehicles.

The aim of Task 30 is to analyse and assess environmental effects of electric vehicles (EVs) on water, land use, resources and air based on life cycle assessment in a cooperation of the participating countries in the International Energy Agency (IEA).

Task 30 is using the results of the completed Task 19 “Life Cycle Assessment of Electric Vehicles” (2011 – 2015, www.ieahev.org/tasks/task-19-life-cycle-assessment-of-evs/, led by JOANNEUM RESEARCH) as a foundation to subsequently examine the environmental effects – benefits and impacts - of vehicles with an electric drivetrain (EVs), based on life cycle assessment (LCA). With an eye on the three phases of LCA, such as production, operation and dismantling of EVs, various environmental effects of EVs on water, land use, resources and air, among others, will be analysed and assessed. Thereby a strong accent is put on the comparison of environmental effects between pure battery EVs (BEV) and Plug-in hybrids (PHEVs) on one hand and conventional ICE vehicles using gasoline, diesel and natural gas on the other side.

In Task 19 the focus of the activities was on the analyses of the process chain and in Task 30 the focus is on the environmental effects on water, land use, air resources and waste (Figure 1)

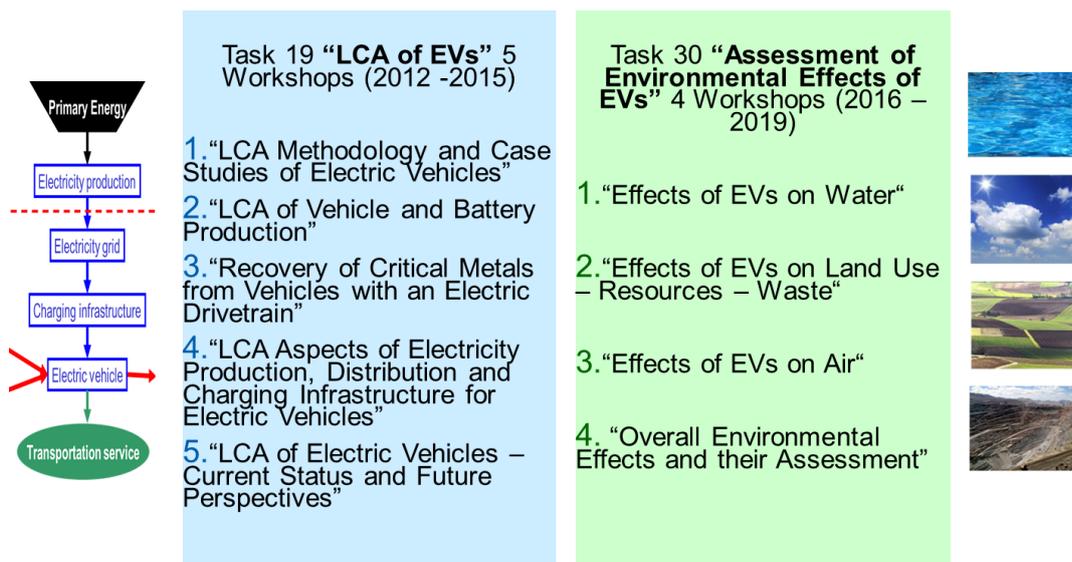


Figure 1: From Process Chain analyses (Task 19) to Environmental Effects (Task 30)

Task 30 focuses on following topics covering methodologies, data and case studies:

- Effects of EVs on water (emissions to water, waste water, “Water Footprint” of EVs)
- Effects on EVs on land use-resources-waste (land use, occupation and degradation, demand of renewable and fossil resources, recycling)
- Effects on EVs on air (local emissions and effects of NOx, PM and CxHy, human health effect and non-energy related emissions from tires and brakes)
- Overall environmental effects and their assessment (comparing and assessing different impact categories, single score methodologies, stakeholder involvement)

Within the Task, methodologies for helping countries implement EVs by identifying possibilities to maximize the environmental benefits will be developed. Besides, various case studies will be analyzed and networking combined with information exchange will be supported within the Task’s frames (Figure 2). For the purpose of research, the extension of the already in Task 19 established and international “Research Platform for Life Cycle Assessment (LCA) and End-of-Life Management for Electric Vehicles” will be challenged.

The Task will proceed by holding a series of workshops addressing the following objectives:

- Methodologies on assessment of environmental effects
- Analyses of necessary and available data
- Overview of international studies/literature
- Analyses of current knowledge and future challenges
- Overview of key actors and stakeholders and their involvement
- Communication strategies to stakeholders
- Summarizing further R&D demand

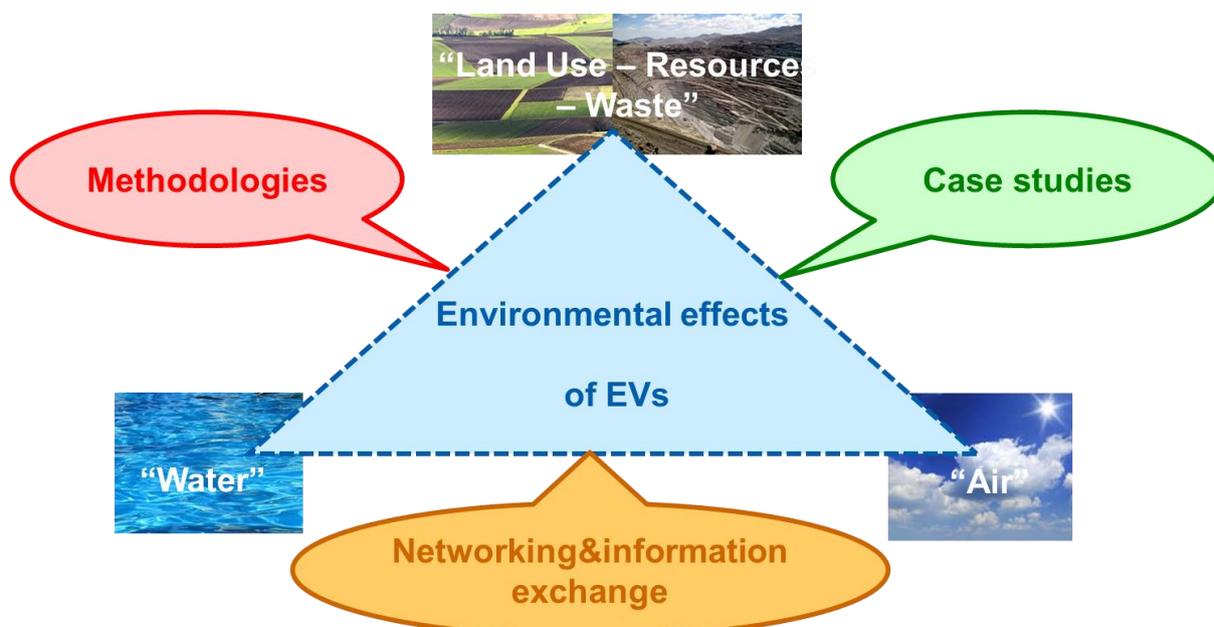


Figure 2: Working method in Task 30

Expected Results

Members in this Task will compile a list of environmental benefits and impacts of EVs with the goal to increase their overall acceptance by providing facts and figures on the environmental effects of EVs. Thus, numerous advantages of EVs compared to conventional vehicles will be shown. These results should help the industry and government to support further development and employment of EVs in all transport modes. The results will document and summarize the state of current knowledge and future challenges (incl. methodologies and case studies) on

- Effects of electric vehicles on water
- Effects of electric vehicles on Land use – resources – waste
- Effects of electric vehicles on air
- Overall environmental effects and their assessment of EVs
- R&D demand

In addition to these technical and scientific results a glossary on “Frequently asked questions” (FAQ), a framework for Communication strategies to stakeholders and dissemination activities (e.g. proceedings, reports, papers, notes, presentations) will be available.

Contact Details of the Operating Agent

For further information, please contact the Task 30 Operating Agent:

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www.ieahev.org/tasks/task-30-assessment-of-environmental-effects-of-electric-vehicles/