TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Forst-, Geo- und Hydrowissenschaften, Fachrichtung Wasserwesen,

Institut für Abfallwirtschaft und Altlasten, Lehrstuhl für Abfallwirtschaft

Riskcycle (Introduction)

Risk-based management of chemicals and products in a circular economy at a global scale

Prof.Dr.-Ing.habil. Dr.h.c. Bernd Bilitewski

Barcelona, 14th Oct. 2009

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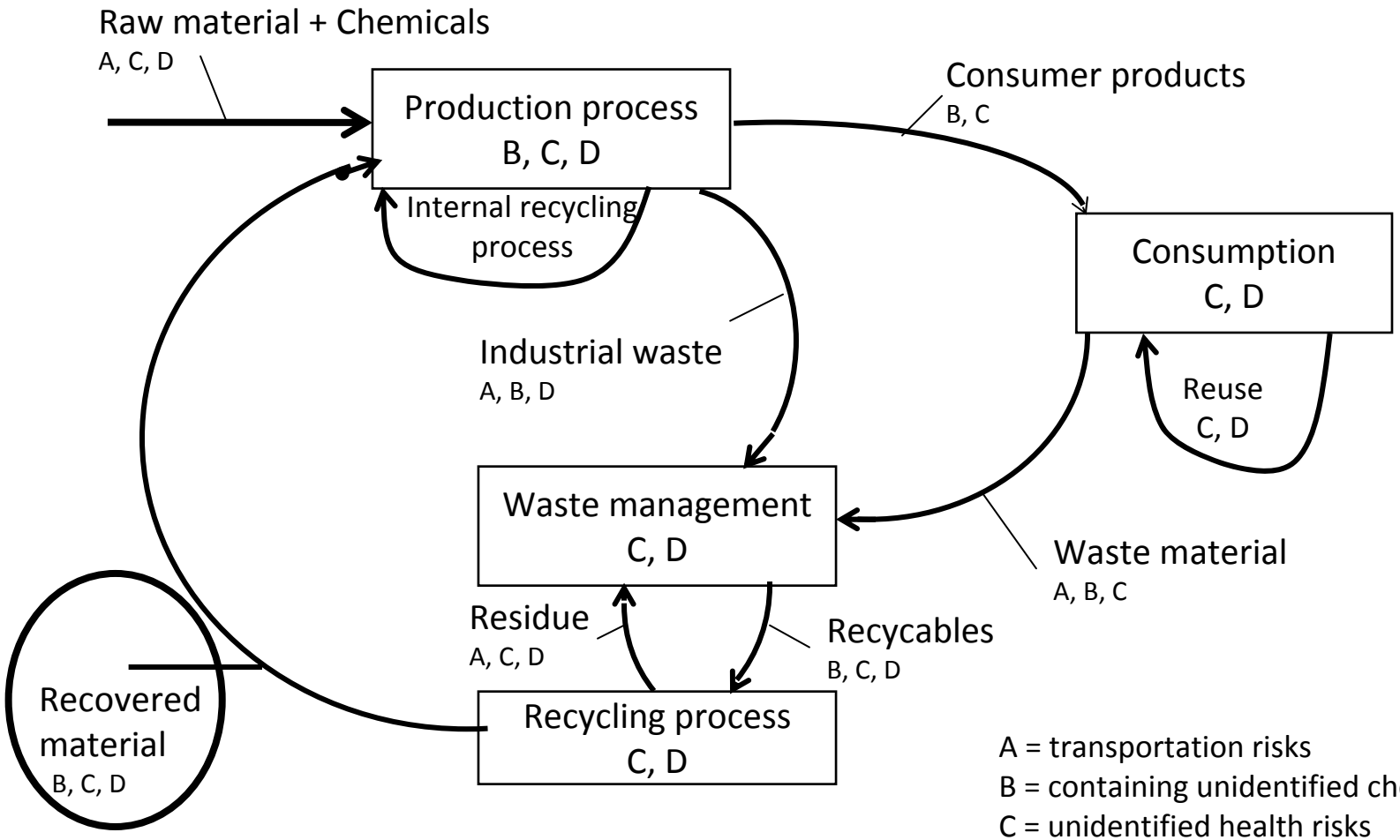
RISKCYCLE

A global network of information about the risk of chemicals and additives in products

A Coordination Action not a Research Project!

Why a Coordination Action like RISKCYCLE?

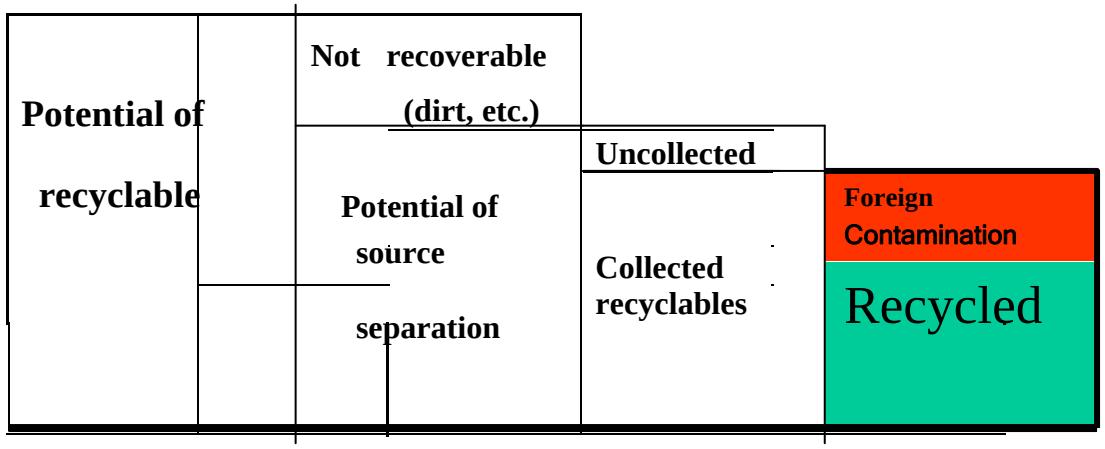
(Scientific and technical relevance)



Simplified material flow of a circular economy in a global scale with health and environmental risks

Estimation of source separation

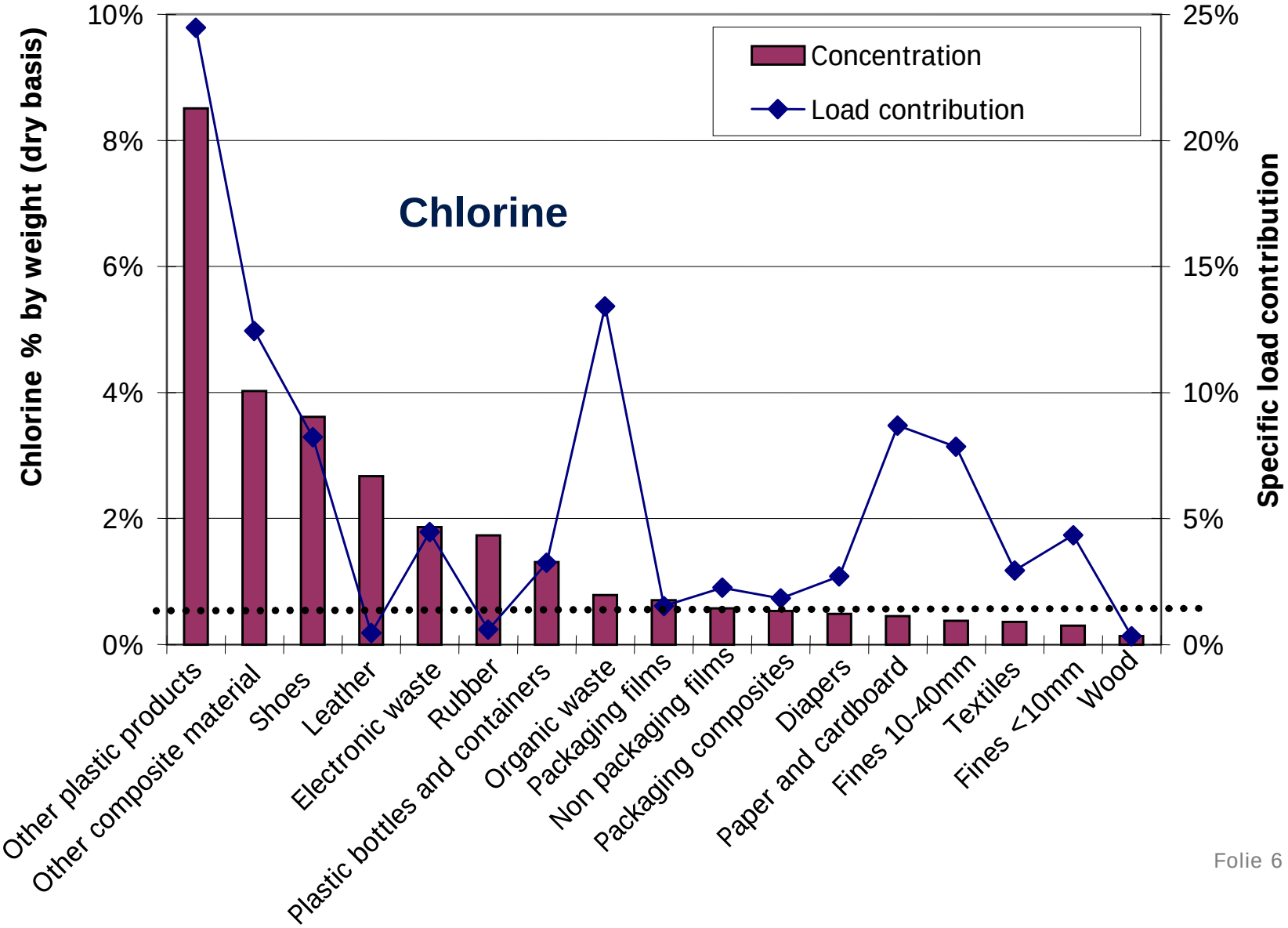
- **Relationship between recyclable and actually recovered:**



Potential of source separation x sorting efficiency = collected recyclables

Sources of Pollutants in Waste

Chlorine in waste fractions and their specific load contribution referred to household from urban areas



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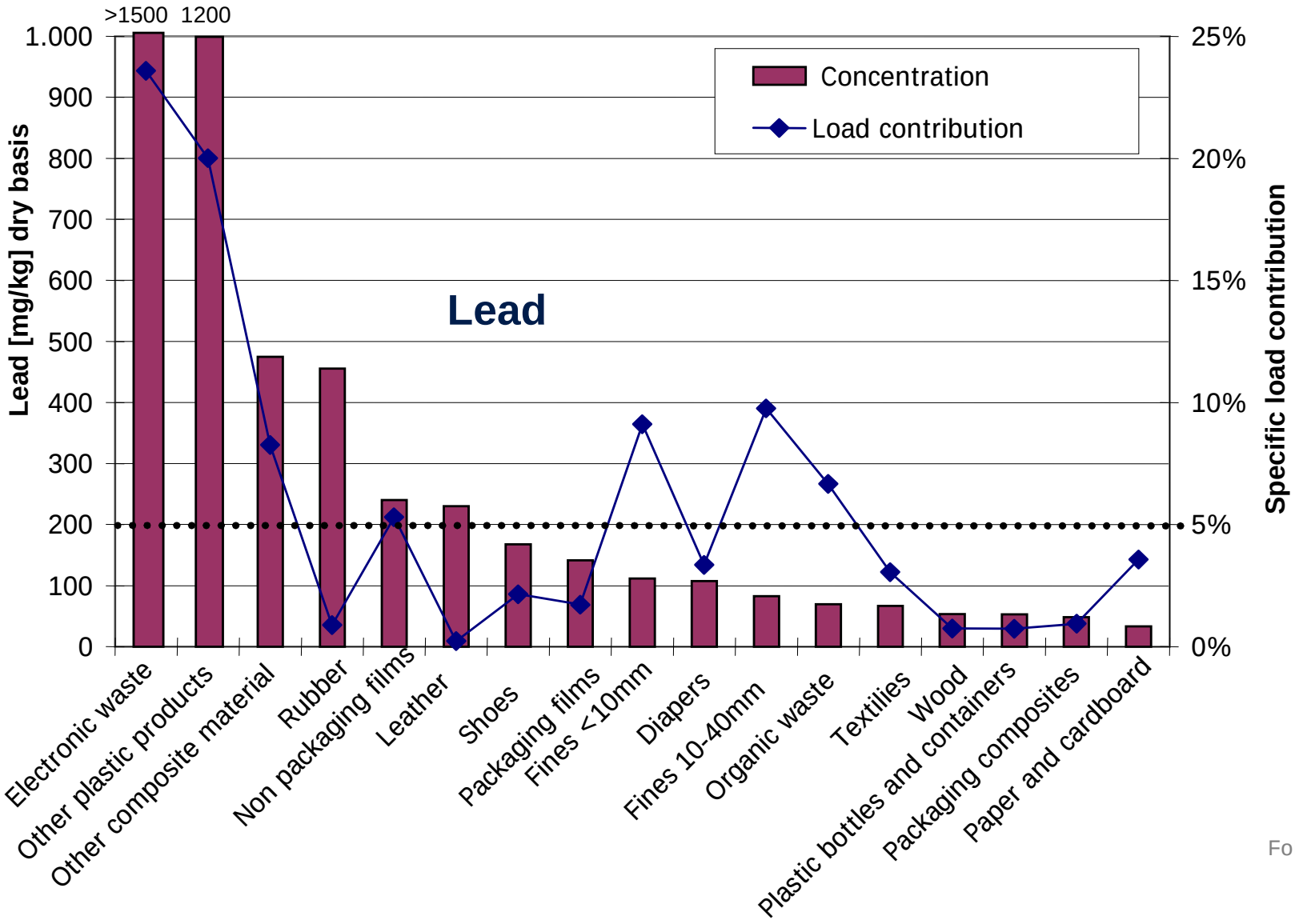
Lead in waste fractions and their specific load contribution referred to household from urban areas



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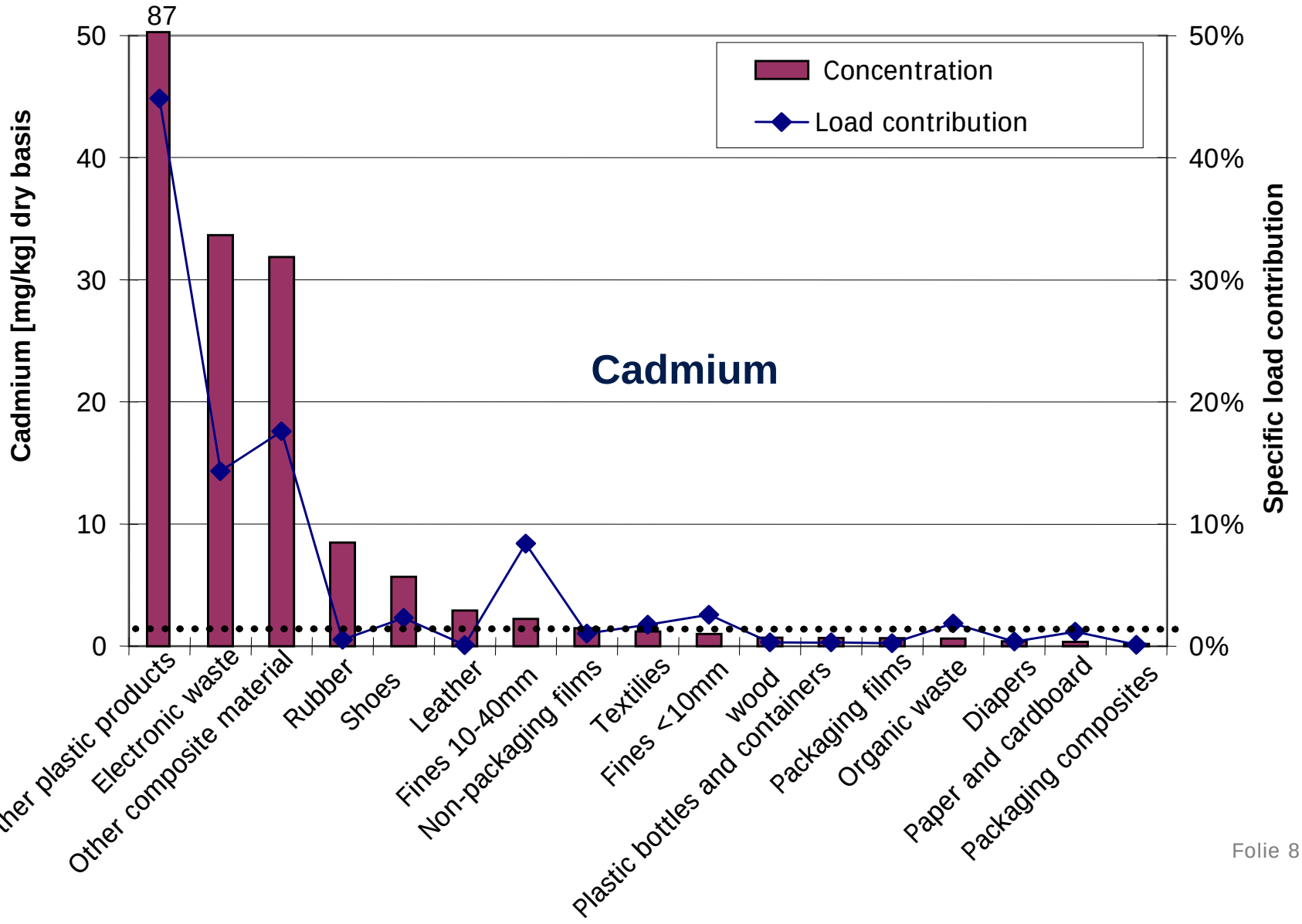
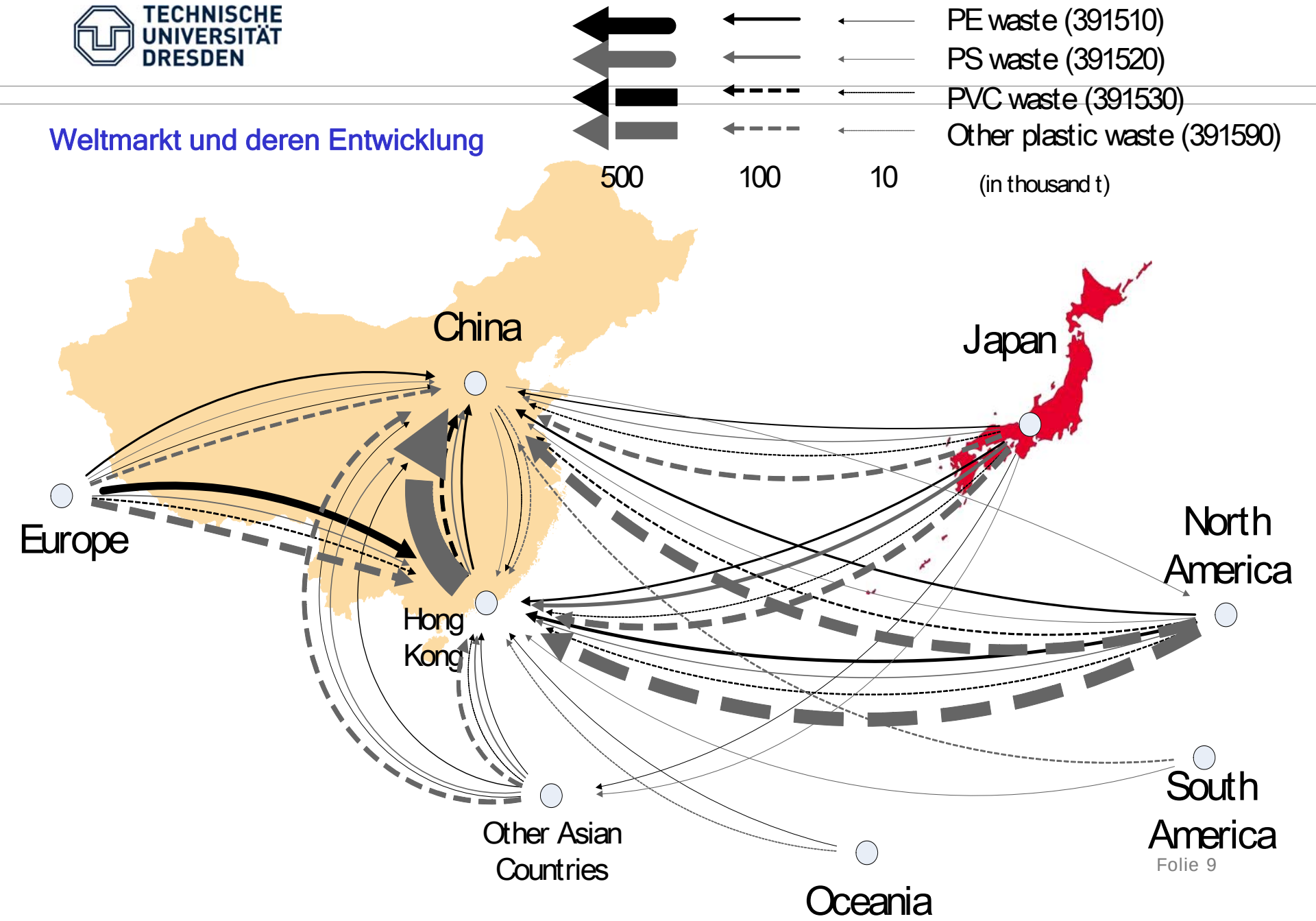
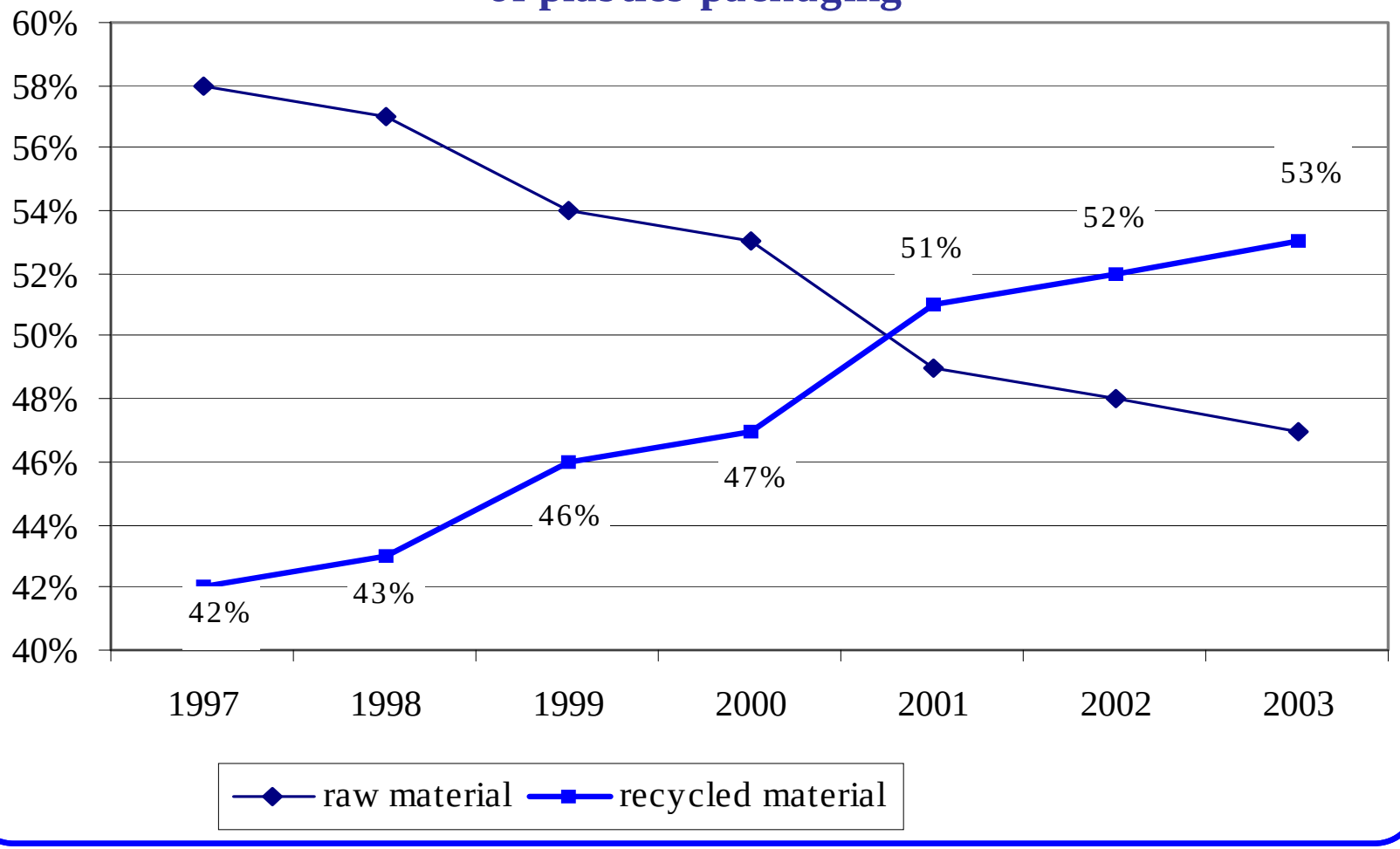
Cadmium in waste fractions and their specific load contribution referred to household from urban areas

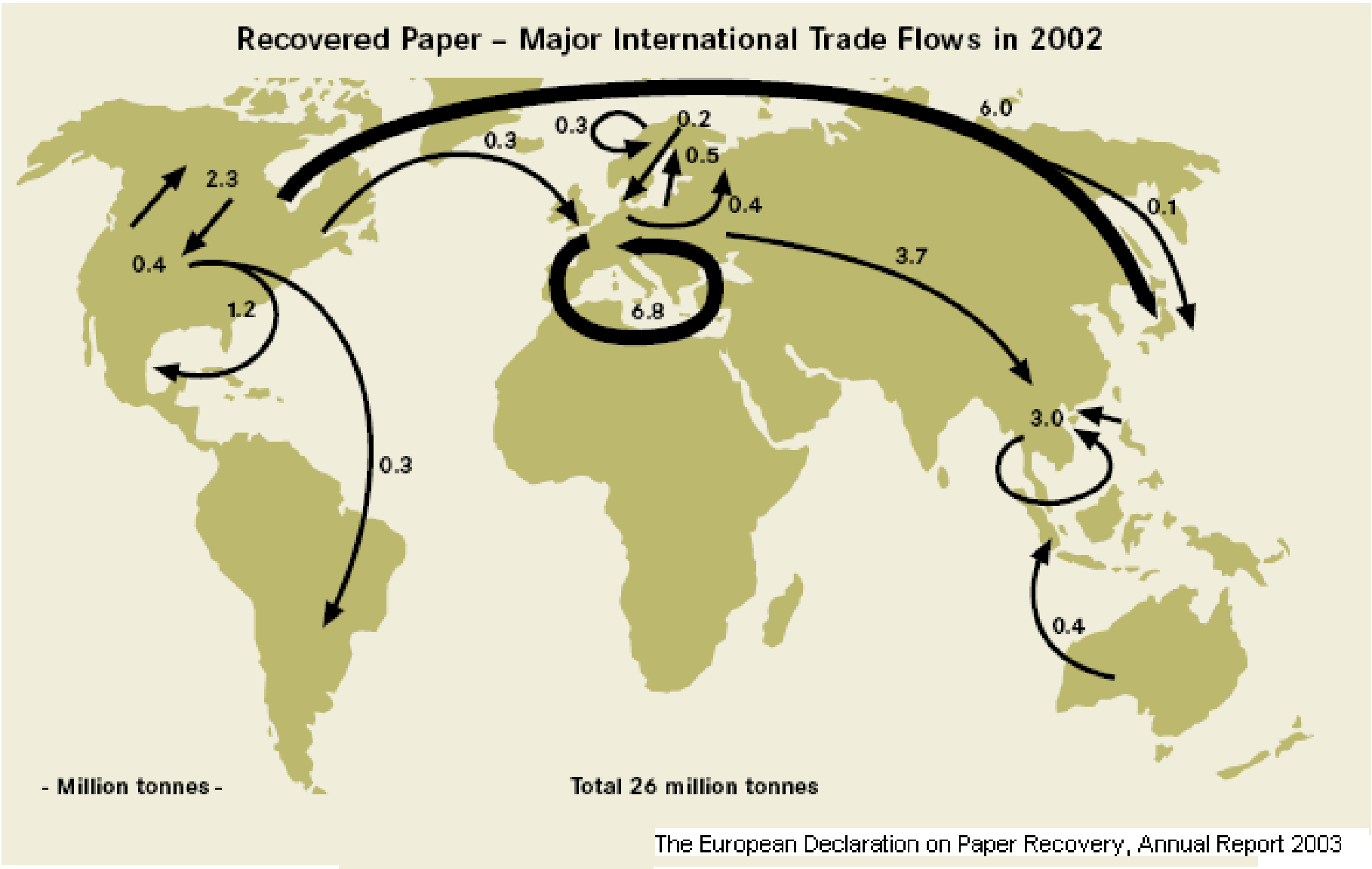


Weltmarkt und deren Entwicklung



Shares of plastics amounts used for material recycling or as secondary raw material from the total utilised amount of plastics packaging





The European Declaration on Paper Recovery, Annual Report 2003

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The paper chain a good example for successful recycling in Germany.

Total production of paper & cardboard of ***12,941 million Mg*** in ***1992***, rose to ***23,319 million Mg*** in ***2007.***

The utilisation rate rose from ***52.1 % in 1992*** to ***68.1 % in 2007.***

Separately collected graphical paper a rate for recycling of ***86.9 %.***

A deeper analysis of the data revealed that in selected areas the quality of the separately collected graphical paper is good enough to principally meet the requirements the paper industry has established for de-inking material without further processing steps.

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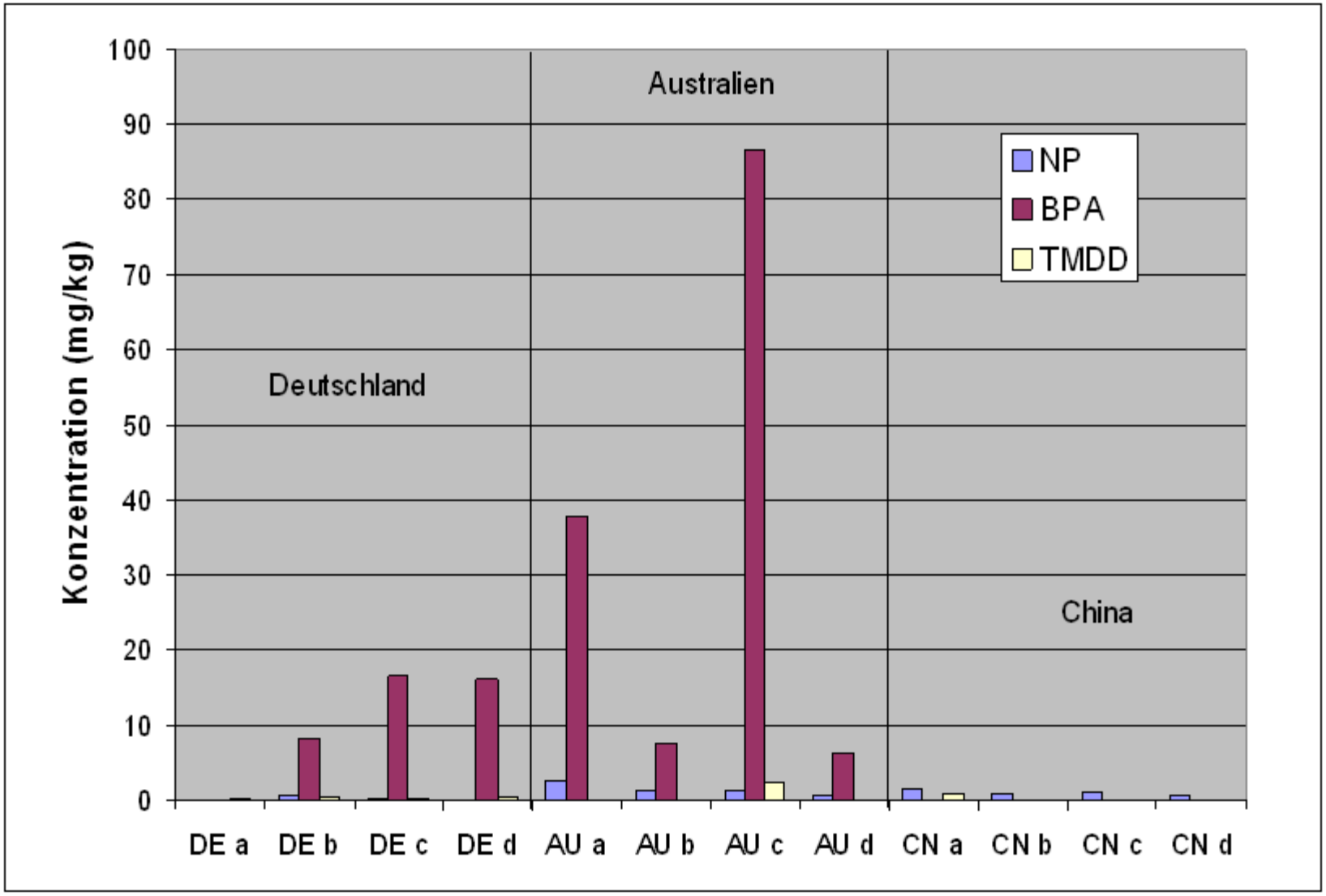
Recycling toilet paper from Germany, Australia and China contaminated with 2,4,7,9-Tetramethyl-5-decin-4,7-diol (TMDD), Biphenyl A, and 4-Nonylphenol(Gehring, Vogel, Bilitewski 2009)



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Riskcycle - COORDINATION ACTION

What should be a COORDINATION ACTION (philosophy):

1. To define future needs of R & D contributions for the innovation in the filed of risk-based management of chemicals and products in a global perspective using alternative testing strategies

2. To compile information on present activities in this area and make it widely available

3. To ensure the sustainable development of industrial society at global scale by encouraging international bodies to strength their activities in this field

4. To improve the competitiveness of the European industry at global scale

5. To encourage and list all relevant involved groups from industry, research and legislation at global scale to facilitate co-operation, communication and networking in this field

Objectives:

1. To establish a global network of key elements to be considered for the safety and risk assessment information about the risks of hazardous additives in chemicals, products and recycling products

2. To specify demands for tools for ecological design of products, production, use of products and wastes generated for recycling. Methods as LCA, risk analysis, environmental impact analysis, mass flow balance analysis, economic related tools should be used.

3. To collect data on usage, risks, chemical properties, labeling,..about the fate of certain chemicals in products traded, used and recycled in a global scale

4. To contribute to the UN Globally harmonized system (GHS) for chemical substances and mixtures in recovered products

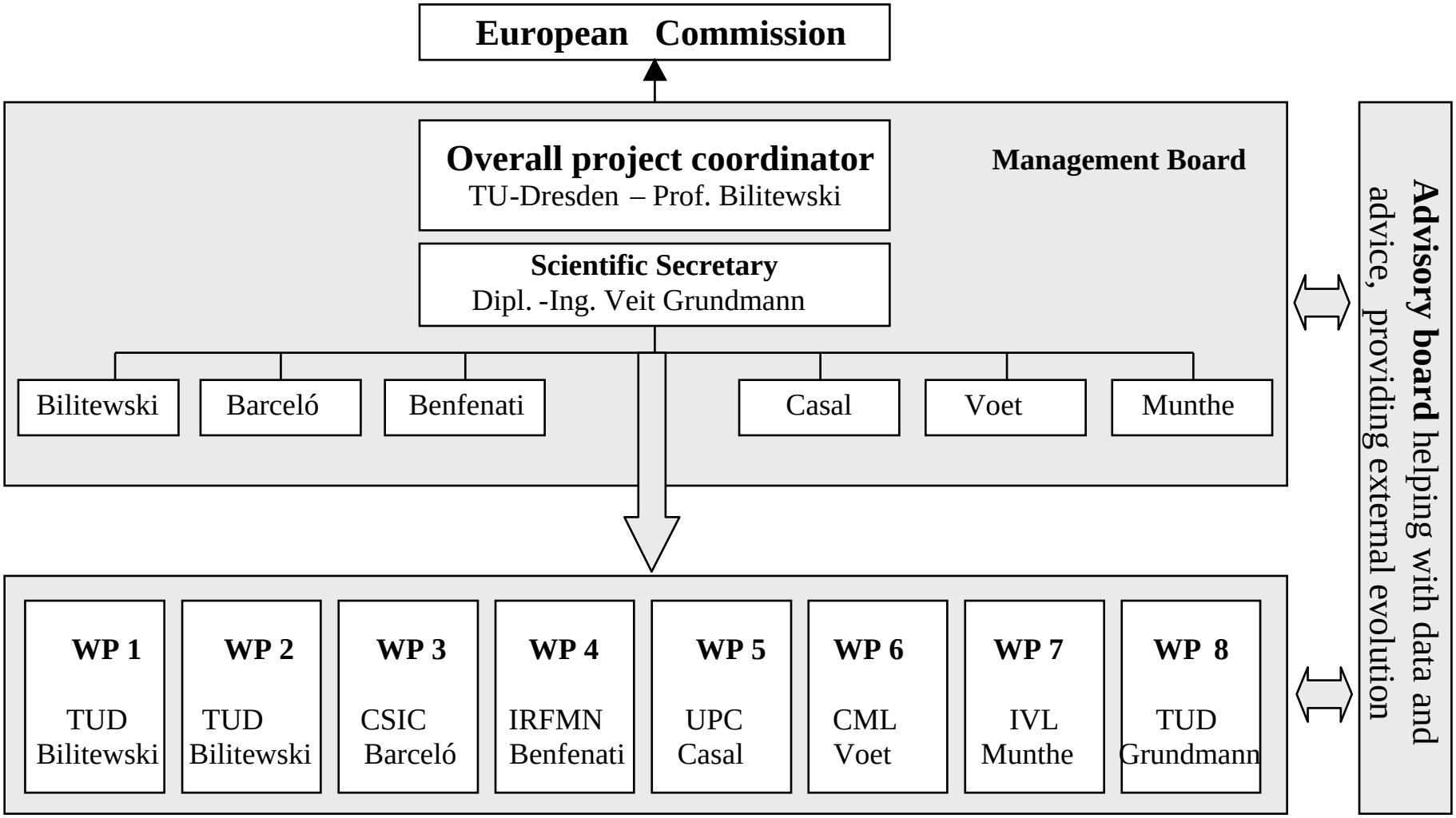
Objectives:

5. To develop a global strategy for a risk-based management of additives in trade recycling products

6. Identifying alternative testing methods to avoid the enlargement of animal testing in respect of recycling

7. Identification of knowledge and research gaps for future research activities

8. To consider the most effective way of ensuring continuing progress in this field involving EU and other partners at global scale including also international organizations


European Commission
Overall project coordinator
TU-Dresden – Prof. Bilitewski
Management Board
Scientific Secretary
Dipl. -Ing. Veit Grundmann
Bilitewski
Barceló
Benfenati
Casal
Voet
Munthe
WP 1
TUD
Bilitewski
WP 2
TUD
Bilitewski
WP 3
CSIC
Barceló
WP 4
IRFMN
Benfenati
WP 5
UPC
Casal
WP 6
CML
Voet
WP 7
IVL
Munthe
WP 8
TUD
Grundmann
Advisory board helping with data and advice, providing external evolution

Work packages

WP1: Coordination (TUD)
WP2: Capacity building (TUD)
WP3: Fate and behaviour of chemicals and products (CSIC)
WP4: Alternative toxicity testing for additives (IRFMN)
WP5: Risk assessment methodologies (UPC)
WP6: Life cycle assessment of additives (CML)
WP7: Socio-economic aspects related to chemical risks (IVL)
WP8: Global Strategy for Risk Based Management (TUD)

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Work package leaders

Member of the Management Board		Participation in RISKCYCLE
1	Bernd Bilitewski	Project Coordinator
2	Veit Grundmann	Project Scientific Secretary
3	Damià Barceló	Leader of WP 3
4	Emilio Benfenati	Leader of WP 4
5	Joaquim Casal	Leader of WP 5
6	Ester Van der Voet	Leader of WP 6
7	John Munthe	Leader of WP 7
8	Veit Grundmann	Leader of WP 8

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Issues

- focus on the fate and behaviour of additives in six sectors:

  textile, electronics, plastics, leather, paper and lubricants

- trade and recycling of chemicals and products containing chemical additives

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Issues

- substantial release of harmful substances during the recycling proccess and use of recycling products to the environment with risk to man and nature

- in a circular economy the trade and the recycling in a global dimension is not acceptable without a globally agreed risk assessment

  -> for existing and newly developed chemicals and products without using additional test animals

- Especially recycling products with an unknown origin must be carefully considered and evaluated

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Objectives

- The RISKCYCLE network will closely collaborate with related projects, EU and international bodies and authorities to communicate and agree on standards and to avoid duplication and redundant work.

- The RISKCYCLE initiative will influence policy issues at a global scale, not only in developing countries but also in developed ones and will create awareness and enhance state of the art on risk-based management of chemicals.products and recycling products among stakeholders.

- The primary aim of RISKCYCLE is to identify future R&D needs required to establish a risk-based assessment methodology for chemicals and recycled products that will help minimize animal testing while ensuring the dual aim of allowing the development of new chemicals and minimizing risks for health and the environment.

Thank you for your attention!

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Institute of Waste Management and Contaminated Sites Treatment

FP7 project RISKCYCLE (226552)

Timetable, workshops

Contents

1. Timetable

Month		Month		Month	
1	Sep 09	13	Sep 10	25	Sep 11
2	Oct 09	14	Oct 10	26	Oct 11
3	Nov 09	15	Nov 10	27	Nov 11
4	Dec 09	16	Dec 10	28	Dec 11
5	Jan 10	17	Jan 11	29	Jan 12
6	Feb 10	18	Feb 11	30	Feb 12
7	Mar 10	19	Mar 11	31	Mar 12
8	Apr 10	20	Apr 11	32	Apr 12
9	May 10	21	May 11	33	May 12
10	Jun 10	22	Jun 11	34	Jun 12
11	Jul 10	23	Jul 11	35	Jul 12
12	Aug 10	24	Aug 11	36	Aug 12

2. Project schedule

	Year 1 (2009/10)						Year 2 (2010/11)						Year 3 (2011/12)					
	2 09/10 2009	4 11/12 2009	6 01/02 2010	8 03/04 2010	10 05/06 2010	12 07/08 2010	14 09/10 2010	16 11/12 2010	18 01/02 2011	20 03/04 2011	22 05/06 2011	24 07/08 2011	26 09/10 2011	28 11/12 2011	30 01/02 2012	32 03/04 2012	34 05/06 2012	36 07/08 2012
WP1 – Coordination and management																		
WP2 – Capacity Building	K[1]				W[2]			W[2]			W[2]		W[2]			C[3]		
WP3 – Fate and behaviour of additives																		
WP4 – Alternative toxicity testing for additives																		
WP5 – Risk assessment methodologies for additives																		
WP6 – Life Cycle Assessment																		
WP7 – Socio-economic aspects																		
WP 8- Global strategy for risk based management																		

[1] **Kick-Off Meeting**
[2] **Workshops**
[3] **Final Conference**

3. Workshops

Time suggestions

1st WS: Vietnam (HUS)	**3rd – 6th May 2010**
2nd WS: CHINA (ICEEE)	**15th – 18th Nov 2010**
3rd WS: Brasil (COPPETEC)	**2nd – 5th May 2011**
4th WS: India (TERI)	**11th – 14th Oct 2011**
Final Conference in Dresden	**7th – 10th May 2012**

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Connected Symposiums:

SETAC EUROPE Annual meeting
Sevilla 2010 **24th – 27th May 2010**

Hazardous and Industrial Waste Management
CRETE 2010 **5th – 8th Oct 2010**

3rd International Biomass and Waste to Energy symposium
VENICE 2010 **8th – 11th Nov 2010**

SETAC EUROPE Annual meeting
Milano 2011 **May 2011**

13th International Waste Management and Landfill Symposium
SARDINIA 2011 **3rd – 7th Oct 2011**

SETAC EUROPE Annual meeting
Berlin 2012 **May 2012**

3. Workshops

- **State of affairs of every work package**
  - **preliminary findings and results**
  - **more detailed presentations**
  - **specific topics of each country**
  - **review of research needs**

3. Workshops

- **Organisation from the respective beneficiary**
- **Special topic for every WS (decision deadline: 15th Jan 2010)**
- **Platform for exchange of information**
- **Invitations for: publicity, reporters, ministers, researchers**
- **2 or max. 3 days of presentations + 1 day RISKCYCLE meeting**

3. Workshops

- **Workshop proceedings**
- **Keep respective VISA and vaccination regulations in mind**
- **Invitations from beneficiary needed - early in advance**

- **VISA regulations for respective country until 6th Nov 2009 to co-ordinator (date of birth, passport number, …?)**

3. Workshops

Workshop proceedings

- **Executive summary in review of the workshop**
- **Projects presented**
- **Poster contributions**
- **List of participants**

After every workshop an executive summary will be disseminated to inform about the research needs and gaps.

4. Final Conference

- **Will be held in Dresden – May 2012**
- **100 to 150 participants**
- **Exclusively in English - no translation will be provided**
- **WP-leaders will prepare a symposium at the conference with a thematic focus related to their work package**
- **platform for exchange of information**
- **involving of scientists, policy-makers and stakeholders related with the chemicals and risk assessment**
- **summarizing and highlighting the achievements of RISKCYCLE**

CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

CSIC

MINISTERIO DE EDUCACIÓN Y CIENCIA

Spanish Council for Scientific Research (CSIC)

Institute of Environmental Diagnosis and Water Research (IDAEA)

Department of Environmental Chemistry

Barcelona, SPAIN

WATER AND SOIL QUALITY UNIT

Prof. Damià Barceló team

8 Scientific staff

Dr. Miren López de Alda
Dr. Mira Petrović
Dr. Antoni Ginebreda
Dr. Ethel Eljarrat
Dr. Silvia Díaz-Cruz
Dr. Sandra Pérez
Dr. Marinel.la Farré
Dr. Rikke Brix

14 Ph.D. students

3 Technicians

EU PROJECTS

6th FRAMEWORK PROGRAM (IPs, STREPs and CAs)

2003

- **HORIZONTAL** — October — Completed

2004

- **SWIFT** — January — Completed
- **AQUATERRA** — June — Completed
- **EMCO** — July — Completed
- **NOMIRACLE** — November

2005

- **MODELKEY** — Febrer — Completed in 2009
- **NORMAN** — September

2006

- **PROMOTE** — September
- **RISKBASE** — September — Completed in 2009
- **SOCOPSE** — November — Completed in 2009

2007

- **INNOVA-MED** — January
- **KNAPPE** — February

EU PROJECTS
7th FRAMEWORK PROGRAM

2007 — CONFFIDENCE

Granted

2008 — RISKCYCLE

AQUA-NANOTREAT

SENS-MAR

FLUO-FOOD

FP7-KBBE-2008-3-3-02
Aquatic anaerobic bioremediation

EXPERTISE

Trace organic analysis

Water (river, sea, drinking, ground and wastewater)
Solid samples (sludge, soil, sediment and biota)
Emerging contaminants & persistent contaminants

Fate and behaviour of organic contaminants in the water cycle

Wastewater/drinking water treatment
Advanced treatment technologies
Fate in the receiving environment

Biosensors and toxicity assays

CellSense, RIANA, SENSIA, BIOSENSOR SL
ToxAlert ®100, Abratox Camera

Chemometric analysis

Environmental Risk Assessment

Relationships between chemical and ecological status

Water Management and Water Regulations (WFD)

Method optimization
Validation
Degradation studies
Stability studies
Characterization and determination

EXPERTISE
COMPOUNDS

Persistent Organic Compounds

- Priority compounds
- PAHs
- Pesticides

Emerging Contaminants

- Pharmaceuticals & Personal Care Products
- Illicit Drugs
- Hormones (Estrogens, Progestogens, Phytoestrogens)
- Surfactants
- Nanomaterials (Fullerenes …etc.)
- Gasoline additives
- Brominated Flame Retardants
- Perfluorinated compounds
- UV Solar Filters

Polychlorinated *n*-alkanes

Analytical method under development during 2009

RISKCYCLE contribution

- WP2. Capacity Building
- WP3. Fate and behaviour of additives
- WP4. Alternative toxicity testing for additives
- WP5. Risk assessment methodologies

WP3. Fate and behaviour of additives

WP Leader: CSIC

Partners: URV, UNICATT, CERTEC, Mario Negri, IVL, TUD

Objective:

- Deep study of the additives' flow from the production to recycling and waste for the following industrial sectors: Textile , Electronics, Plastics, Paper and Lubricants

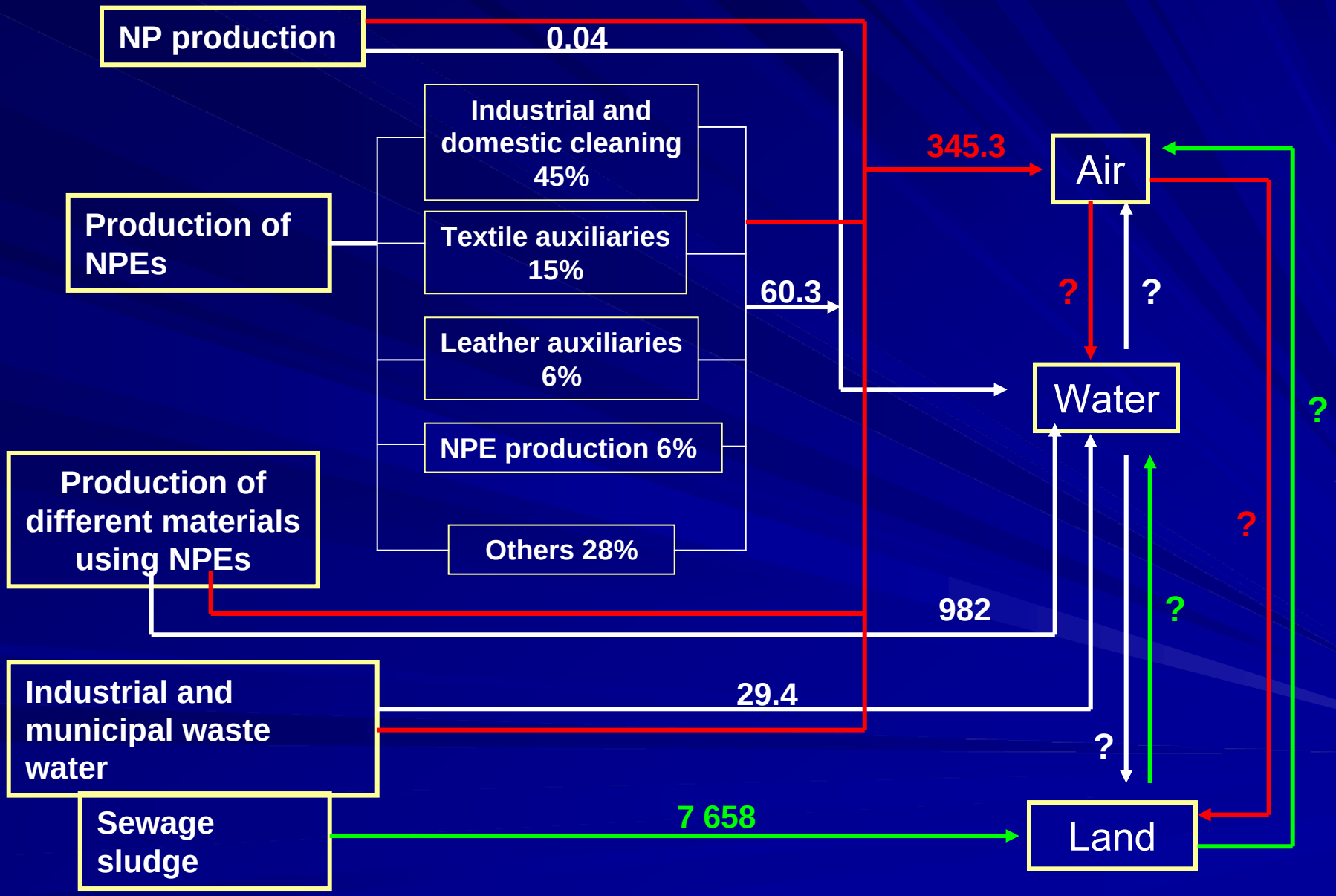
WP3. Fate and behaviour of additives

Deliverables:

1. Databases of additives used in consumer and industrial products (PhD student working on this)- Establishment of a global network of information on additives *(focusing on the selected industrial sectors).*

2. Flow diagrams of the main additives from production to recycling and waste *(focusing on the selected industrial sectors).*

Flow Diagram production: NP example

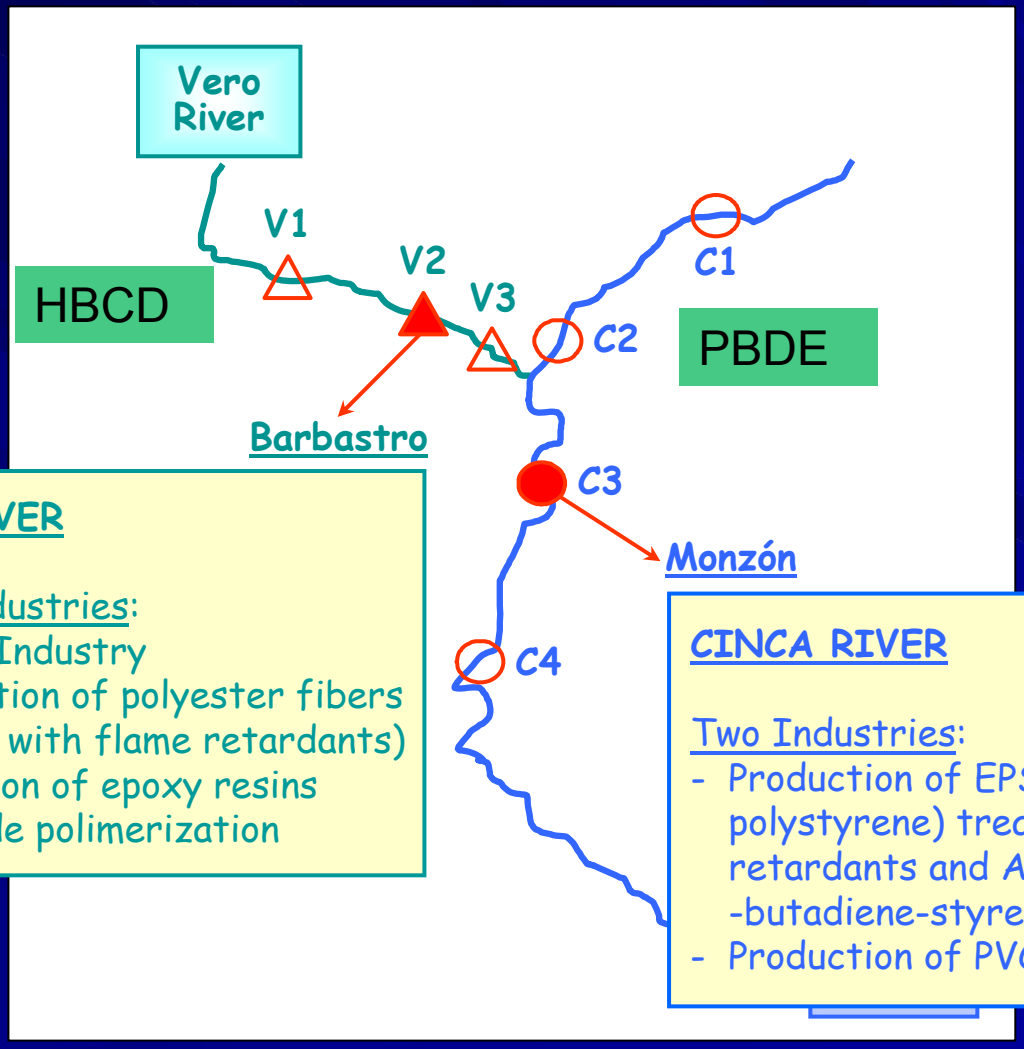


WP3. Fate and behaviour of additives

Examples of research on additives:

- Brominated Flame Retardants (BFR)
- Additives in Paper-mill production
- Additives in Gasoline (MTBE)

Brominated Flame Retardants



VERO RIVER

Three Industries:
- Textile Industry
  (Production of polyester fibers treated with flame retardants)
- Production of epoxy resins
- Polyamide polimerization

CINCA RIVER

Two Industries:
- Production of EPS (Expandable polystyrene) treated with flame retardants and ABS (Acrylonitrile -butadiene-styrene)
- Production of PVC

Sources of Contamination – Analysis of Industrial Effluents

	HBCD (ng/L)	BDE-209 (ng/L)
EPS and ABS production	**4980**	nd
PVC production	nd	nd
Polyester fibers production	nd	5
Epoxy resins production	nd	45
Polyamide polymerization	nd	**2600**

Additives in the paper-mill process:

- Fillers
- Strengthen agents
- Whiteners
- Dyes
- Defoamers
- Biocides for incoming water
- Slimicides for process water
- Dispersion agents and surfactants

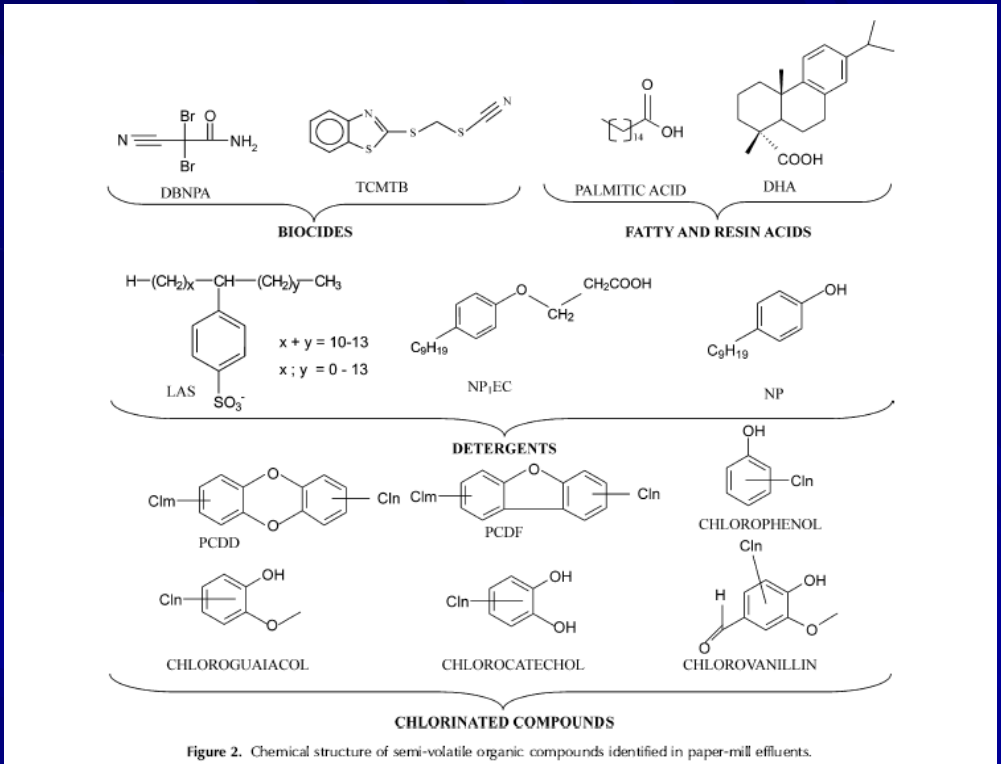


Figure 2. Chemical structure of semi-volatile organic compounds identified in paper-mill effluents.

Lacorte et al (2003). Trends in Analytical Chemistry, Vol. 22. No 10.

Additives in Gasoline: MTBE

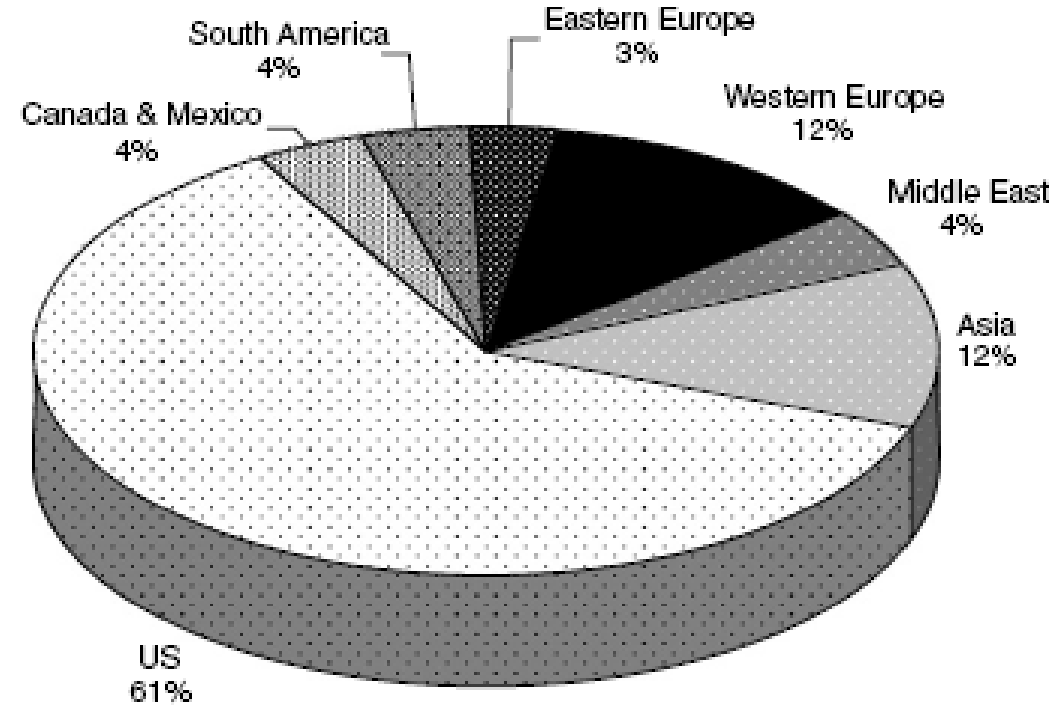


Figure 1. MTBE global use in 1999. The total worldwide annual production was about 21 million tonnes (Data from: MTBE/ Oxygenates Clean Fuels newsletter (2000), DeWitt & Company Inc., Houston, Texas, USA).

Rosell, M., Lacorte, S., Barceló, D. (2006). *Analysis, ocurrence and fate of MTBE in the aquatic environment over the past decade*. Trends in Analytical Chemistry, Vol. 25, No.10.

WP4
Alternative Toxicity Testing for additives

Emilio Benfenati – IRFMN – Leader of WP4

WP4 - Lead & Partners

• Lead:
Dr Emilio Benfenati
Istituto di Ricerche Farmacologiche “Mario Negri” (IRFMN) – Milan, Italy

• Partners

Consejo Superior de Investigaciones Cientificas (CSIC) - Barcelona, Spain

Universitat Rovira i Virgili (URV) – Spain

TuTech inovations GmbH (TUTECH) – Germany

Tecnical University of Denmark (DTU) - Denmark

WP4 – Timetable and Objectives

Time	Year 1						Year 2						Year 3					
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
WP 4																		

Objectives

• to identify alternative testing methods for chemicals and additives in products avoiding the enlargment of animal testing;

• to identify criteria for non-testing methods (NTM) for the pratical use of safety and risk assessment;

• to identify suitable experimental database/data sets for the ecotoxicological, toxicological and environmental endpoints;

• to make a review and a check of the performances of suitable (Q)SAR models and NTM;

• to assess the applicability domain and the safe use of NTM.

Emilio Benfenati – IRFMN – Leader of WP4

WP4 – Tasks

TASK 4.1

Partner TUTECH will make a **survey of the regulatory status of non-animal methods**, with focus on aquatic environment.

Partner CSIS will address **bioassays and biosensors**.

Partner IRFMN will define the **criteria for evaluation of the NTM**, considering the specificity of the purpose.

Partners IRFMN and TUTECH will summarize the **documents relative to the assessment of NTM**, and **list the parameters for evaluation**, assigning scores to be used for the review of the methods. For the scoring purposes, Partner IRFMN will also **evaluate the models.**

Different criteria will be identified for the classification and labelling and for the risk assessment.

WP4 – Tasks

TASK 4.2

Partners IRFMN and URV will **identify data collections**. For tens of chemical compounds we will **compare different property data**, present in the defined databases and data collections.

The quality and suitability of the data will be evaluated in relation to the protocols defined by the legislation. Each source will be identified with a series of parameters. A **large compendium of data and metadata** regarding to toxicity and ecotoxicity based on known human effects, experimental studies, *in vivo* and *in vitro* tests **will be created** by Partner URV.

WP4 – Tasks

TASK 4.3

Partner CSIC will **evaluate bioassays and biosensors** suitable for the project.

Partners IRFMN and URV will **identify the (Q)SAR models** for toxicological, ecotoxicological, physico-chemical, environmental properties useful for our purposes.

Partners IRFMN and URV will **apply the criteria for assessment of non-testing methods** ***(Deliverable 4.1)*** to screen the models.

Partner DTU will **apply modelling for classification** of additives in products according to GHS.

TASK 4.4 Validation of non-testing methods (1)

Partner IRFMN

(Q)SAR alternative methods will be used on a series of representative chemicals

- checking the performances of the best models identified in Task 4.3
- get suitable data (from Task 4.2)
- calculate the chemical descriptors according to the candidate models selected in Task 4.3
- calculate the predicted values;

TASK 4.4 Validation of non-testing methods (2)

calculate the statistical performances

For regressions: R2, Q2, intercept, the same parameters inverting the axis of predicted, experimental values, maximum error, number of false positives and of false negatives.

For classifiers: false positives and negatives; confusion matrix; accuracy, sensitivity and specificity.

For read-across methods: errors of the predictions, model standard deviations, statistical parameters as for regression, or as classifier, in case of category prediction. (OECD ToolBox , ToxMatch) - new model to chemical additives (URV)

TASK 4.4 Validation of non-testing methods (3)

QUALITY CRITERIA (score system):

OECD guidelines for QSAR and in vitro methods,

ECHA guidelines 2008 (see D4.5)

Klimisch criteria (US EPA)

OSIRIS project documents

WP4 – Tasks

TASK 4.5 – IDENTIFICATION OF BOUNDARIES FOR SAFE USE OF MODELS

Partner IRFMN

- **Identification of the domain in which the error is minimised**.
- **Evaluation of the models** considering the chemical features and the specific aspects of the modelled property and analysing which are the boundaries of the model (applicability domain).
- **Assignment of suitable assessment factors** for a safe use of each validated model.

WP4 – Deliverables & Milestones - Overview

Time	Year 1						Year 2						Year 3					
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
WP 4					*	*				*		*		*		*		

Deliverables

D4.1. Report, containing a discussion on the identified criteria, and their scores, for alternative methods (Month 10)

D4.2. List of databases and meta-databases with assessment. At least 20 databases will be assessed. The list will be present in RISKCYCLE web site (Month 12)

D4.3. Report on the review of bioassays and biosensors and (Q)SAR models as candidate for the intended use. At least 30 alternative methods will be assessed. (Month 24)

D4.4. Report with results of the validation of NTM It will contain data, experimental from in vivo methods, and also from alternative methods, for tens of chemicals, characterised with their variability and uncertainty, on the predicted values. (Month 28)

D4.5. Report with the discussion and identification of the applicability domain and safety factors for each validated model. It will also refer to the recent ECHA document for alternative methods (Guidance on information requirements and chemical safety assessment) (Month 32)

Milestones

M4.1. Candidate QSAR models (Month 20)

Emilio Benfenati – IRFMN – Leader of WP4

DELIVERABLES WP4 – Details - (1)

D4.1. Report, discussion on the identified criteria, and their scores, for alternative methods (Month 10)

D4.2. List of databases and meta-databases with assessment. At least 20 databases will be assessed.

The list will be present in RISKCYCLE web site (Month 12)

D4.3. Report on the review of bioassays and biosensors and (Q)SAR models as candidate for the intended use.

At least 30 alternative methods will be assessed. (Month 24)

DELIVERABLES WP4 – Details - (2)

D4.4. Report with results of the validation of NTM.

For cases studies: data, experimental from in vivo methods, and from alternative methods (characterised with their variability and uncertainty, on the predicted values). (Month 28)

D4.5. Report with the discussion and identification of the applicability domain and safety factors for each validated model. ECHA document for alternative methods -Guidance on information requirements and chemical safety assessment- (Month 32)

Centre for Studies on Technological Risk

Universitat Politècnica de Catalunya

Department of Chemical Engineering.

Diagonal, 647. Barcelona.

http://certec.upc.es

Joaquim Casal and Rosa Mari Darbra

Centre for Studies on Technological Risk

- CERTEC is an organization focused on research and education in the various fields of technological risk
- It was created in 1992 by the Politechnical University of Catalonia (UPC)
- The Catalan government has certified CERTEC as an independent organism to evaluate risk analysis studies (RA, QRA, SMS, etc.) in order to fulfil the Spanish regulations related to major accidents (RD 1254/1999).
- Staff: 15 (chemical engineers, systems engineers, environmental engineers, industrial engineers, chemists, management engineers)

Main research lines:

- Modelling of major accidents
  - BLEVE
  - Hydrocarbon fires
  - Toxic releases
  - Transportation of hazardous materials
- Risk analysis and environmental assessment
  - Establishing frequencies and predicting consequences of industrial accidents
  - Risk indexes for industrial areas
  - Economical assessment of accident effects
  - Environmental risk assessment through fuzzy logic
- Modelling of natural risks
  - Forest fires

Main current projects:

- RISKCYCLE (European Commission, 2009-2012)
- BROMACUA (Fundación BBVA, 200-2012)
- Hydrocarbon fires modelling (Spanish Ministry of Education and Science)
- Study of the flame geometry and the effect of the scale change on the modelling of the forest fire behaviour (Spanish Ministry of Education and Science)
- Study of the physical and geometrical features of the combustion of cutting debris from pinaster forest (Diputació de Barcelona)

Recent Publications:

- Palacios, A; Muñoz, M.; Casal, J. Jet fires: An experimental study of the main geometrical features of the flame in subsonic and sonic regimes. AIChE Journal, Vol. 55, nº 1, pp. 256 - 263, 2009.

- Ronza, A.; Lázaro-Touza, L.; Carol, S.; Casal, J. Economic valuation of damages originated by major accidents in port areas.Journal of Loss Prevention in the Process Industries, Vol. 22, pp. 474-483, 2009

- Darbra, R. M.; Casal, J. Environmental risk assessment of accidental releases in chemical plants through fuzzy logic.Chemical Engineering Transactions, Vol. 17, pp. 287-292, 2009

- Gómez-Mares, M.; Zárate, L.; Casal, J. Jet fires and the domino effect. Fire Safety Journal, Vol. 43, nº 8, pp. 583-588, 2008

- Zárate, L.; Arnaldos, J.; Casal, J. Establishing safety distances for wildland fires. Fire Safety Journal, Vol. 43, nº 8, pp. 565-575, 2008

Centre for Studies on Technological Risk

RISCYCLE PROJECT

Certec contribution to:

- **WP 3: Fate and behaviour of additives**
- **WP 5: Risk Assessment methodologies**
- **WP 7: Socio-economic aspects**

WP5. Risk Assessment Methodologies

WP leader: UPC (Participant num. 4)

Total person month: 13,75

Partners involved: TUDD (1), CSIC (2), URV (2), UCSC (1,5), BRGM (0,75), UPC (6,5)

Start/End: Month 3 - Month 30

Objective:

Identification of different methodologies used to assess the risk of chemical in products for human health and environment

Identification of gaps

Tasks:

- 5.1 Definition of potential risk scenarios during the products' life
- 5.2. Review of the diverse methodologies used in risk assessment
- 5.3. Quantitative approach: estimating frequencies of the typical scenarios and analyzing uncertainties
- 5.4. Estimation of the ultimate consequences of the selected scenarios

Deliverables:

D.5.1. Definition of risk scenarios and historical analysis (Month 9)

D.5.2. Methodologies, frequencies and uncertainties (Month 22)

D. 5.3.Mathematical modelling of effects and example application (Month 30)

Milestones:

M.5.1. Review of methodologies (Month 22)

M.5.2. Successful test case (Month 30)

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RiskCycle – Kick-off meeting

Barcelona 13-15 October 2009

WP6: Life Cycle Assessment of Additives

Ester van der Voet – Jeroen Guinée

CML - Leiden University

SEVENTH FRAMEWORK PROGRAMME

Universiteit Leiden

WP6 – General objectives

- 1. To summarize the state-of-the-art knowledge on LCA studies, LCA inventory data and impact assessment data regarding additives and their applications

- 2. To outline a framework to conduct LCA studies of additives in relation to the three relevant layers of (1) the additives themselves, (2) the materials they are applied in, and (3) the end-products containing the materials

- 3. To collect existing data and knowledge on a limited number of additives to test and illustrate the LCA framework, and identify data gaps and bottlenecks with regard to the LCI and LCIA

WP6 – Core staff

- CML:
  - Ester van der Voet
- Other contributors:
  - DTU
    - Henrik Fred Larsen
  - IVL
    - Tomas Rydberg

WP6 - Resources

Institute	Months
CML	6
DTU	4
IVL	2

Starting date: September 2009 (month 1)
Running time: February 2010 – May 2012 (month 6 - month 33)

WP6 - Description of work

Objective 1:

- Assessing generally available literature as well as information from ongoing projects in EU FP6 and FP7, JRC, UNEP-SETAC Life Cycle Initiative, and other international LCA platforms

Objective 2:

- Collecting and deriving of LCIA factors from RA data from literature and WP5, with approaches as outlined in ReCiPe, OMNIITOX and USETox
- Establishing a coherent LCA framework tailored to additives and their applications, keeping in mind the three layers

Objective 3:

- Outlining cradle-to-grave and cradle-to-cradle chains of selected additives, including the use of energy and raw materials and the emissions of all life-cycle stages: mining/refinery, production and manufacturing, use and waste treatment, including also the influence of additives on EOL options and on the life span of the materials and products they are applied in
- Collecting data on specific selected additives and their applications from existing databases, from WP3 and from industry
- Applying the LCA framework to the selected additives and their applications
- If necessary: adjusting the LCA framework

WP6 - Deliverables

- D6.1 State-of-the art knowledge on LCA studies with relevance for additives (report)
- D6.2 Comprehensive LCA framework for additives and their applications (report)
- D6.3 Database containing LCA (LCI and LCIA) data with regard to selected additives
- D6.4 Results of the illustrative LCA case studies (report)

Milestones

- M6.1 Selection of additives – Month 6
- M6.2 LCA state-of-the-art and first outline of LCA framework presented – Month 9
- M6.3 draft LCIA characterisation factors presented – Month 15
- M6.4 draft results of case studies presented – Month 22
- M6.5 LCA framework presented – Month 26
- M6.6 Input for WP8 Global strategy of risk-based management of additives – Month 18, 24, 32/33

Urgent issues

- Selection of additives
  - Selection criterion for WP6: (LCA) data availability (limited time available for case studies)

- Selection of 3 case studies
  - each case comprising of 3 (partial) LCA's on a specific additive; material (in which the additive is applied); product (in which the material is applied)

D6.1 State-of-the art knowledge on LCA studies with relevance for additives

- Objective:
  - assessing generally available literature & information from ongoing projects in EU FP6 and FP7, JRC, UNEP-SETAC Life Cycle Initiative, and other international LCA platform
- Planning:
  - work will start in month 6 (Feb-10), deliver a draft in month 9 (May-10) and a final report in month 12 (Aug-10)
- Preliminary proposal for division of tasks (under negotiation):
  - CML: Input from past projects (flooring industry, paint industry,...)
  - DTU: Input from ongoing projects (Neptune, LC-Impact, USETox……)
  - IVL: ??

D6.2 Comprehensive LCA framework for additives and their applications

- Objectives:
  - Establishing coherent LCA framework tailored to additives and their applications, keeping in mind the three layers
  - If necessary: adjusting the LCA framework (based on 6.4 results
- Planning:
  - work will start in month 8 (Apr-10), deliver a first outline in month 9 (May-10), draft report in month 26 (and a final report in month 30 (Feb-12)
- Preliminary proposal for division of tasks (under negotiation):
  - CML: Taking the lead of this task ...?
  - DTU: Input to the design of the “additive” fitted LCA framework
  - IVL: ??

D6.3 Database containing LCI and LCIA data with regard to selected additives

- Objectives:
  - Collecting and deriving of LCIA factors from RA data from literature and WP5, with approaches as outlined in ReCiPe, OMNIITOX and USETox
  - Outlining cradle-to-grave and cradle-to-cradle chains of selected additives, including use of energy and raw materials and emissions of all life-cycle stages: mining/refinery, production and manufacturing, use and waste treatment, including influence of additives on EOL options and on life span of materials and products they are applied in
  - Collecting data on specific selected additives and their applications from existing databases, from WP3 and from industry
- Planning:
  - work will start in month 8 (Apr-10), deliver draft LCIA CFs in month 15 (Nov-10) and a final report in month 24 (Aug-11)
- Preliminary proposal for division of tasks (under negotiation):
  - CML: LCI data from existing databases (e.g., ecoinvent), possibly replenished by industry data ...??
  - DTU: Collecting data and estimating LCIA factors regarding (OMNIITOX)/USETox
  - IVL: ??

D6.4 Results of the illustrative LCA case studies

- Objectives:
  - Applying the LCA framework to the selected additives and their applications
- Planning:
  - work will start in month 16 (Dec-10), deliver draft results in month 22 (Jun-11) and a final report in month 36 (Aug-12)
- Preliminary proposal for division of tasks (under negotiation):
  - CML: one LCA (additive-material-product combi) for each partner ? ... to be discussed
  - DTU: LCA modeling (depending on chosen model)
  - IVL: ??

WP6 Overall workplan

Month (2009 - 2010)	Activity	Who
month 6 (Feb-10)	•selection of additives	all
month 9 (May-10)	•Draft D 6.1 •outline of LCA framework presented at Vietnam workshop (D 6.2)	??
month 12 (Aug-10)	•D 6.1 finished	??
month 15 (Nov-10)	•Draft LCIA characterization factors presented at Brazil workshop (D 6.3)	???
month 18 (Feb-11)	•Input for WP8 Global strategy of risk-based management of additives	???
month 22 (Jun-11)	•Draft results of case studies presented at China workshop (D 6.4)	???
month 24 (Aug-11)	•D 6.3 finished •Input for WP8 Global strategy of risk-based management of additives	???
month 26 (Oct-11)	•LCA framework presented at India workshop (D 6.2)	???
month 30 (Feb-12)	•D 6.2 finished	
month 32/33 (Apr/May-12)	•Input for WP8 Global strategy of risk-based management of additives	???
month 36 (Aug-12)	•D6.4 finished	

??? = under negotiation

HOWEVER……

We learnt a lot this morning ….

Challenges o LCA from RiskCycle (new)

- Lacking info in LCA databases on:
  - Additives in bulk materials (e.g.,bisphenyl A and many others); needs to be checked in existing LCA databases like ecoinvent)
  - ….
- Lacking/erroneous info on chains:
  - Recycling not in Europe, but in Asia, Africa, etc.
  - Open loop with leakages to e.g., food chains (rice example)
  - ……
- Lacking impact
  - Working circumstances, particularly recycling outside Europe
  - …..
- Bearing this in mind, what are proper additives for LCA cases?

Urgent issues (revised)

- Selection of products/materials (instead of additives) with related additives (that are currently missing in LCA)
  - 3 bulk materials: e.g., paper (IVL), 1 (?) plastic and gasoline ?
  - Identify lacking additives in existing LCA databases (e.g., ecoinvent)
  - Estimate potentially lacking LCI and LCIA data for additives with the help of ofther partners and WPs ..?
  - Input from Dresden PhD students …?
  - More questions ….?
  - Selection of 3 case studies …. still valid?
    - each case comprising of 3 (partial) LCA's on a specific additive; material (in which the additive is applied); product (in which the material is applied)
  - Original selection criterion for WP6: (LCA) data availability (limited time available for case studies) ….. still valid?

RiskCycle – Kick-off meeting

Barcelona 13-15 October 2009

WP7

Socio-economic aspects related to chemical risks

John Munthe- Mohammed Belhaj

IVL, Swedish Environmental Research Institute

WP7– Overall objective

Analysis of socio-economic aspects for chemical risks in the life cycle of selected consumer products

WP7 – Core staff

- IVL:
  - Mohammed Belhaj – John Munthe
- TUTECH:
  - Susanne Heise

-UPC:

  - Joaquim Casal - Eulàlia Planas

WP7 - Resources

Institute	Months
IVL	5
TUTECH	4
UPC	1
Total	10

Start month: 3

End month: 30

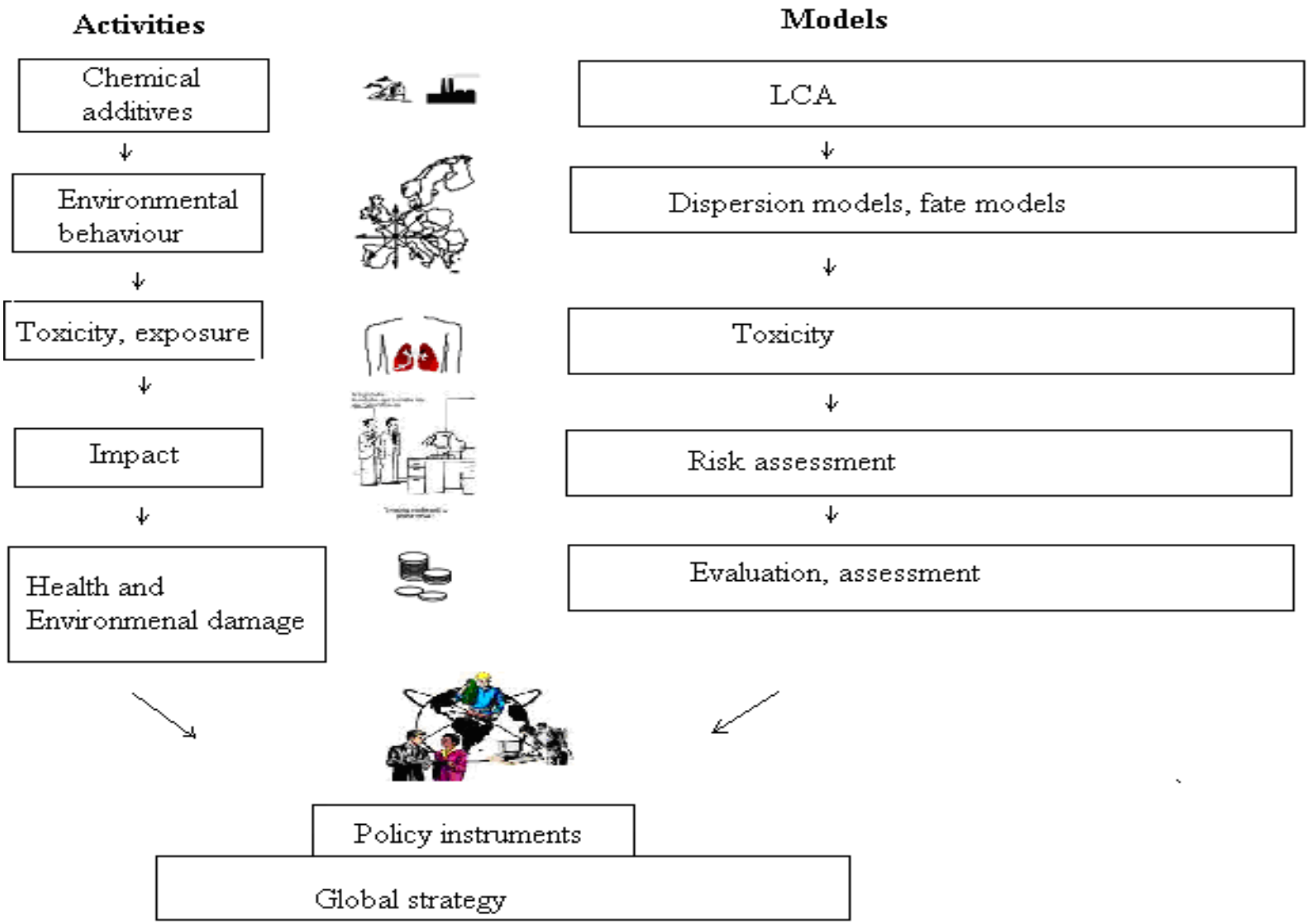
WP 7 - Description of tasks (sub-objectives)

Task 1: Assessment of **damage costs** of chemicals in products based on impact pathway approach including damage to health and human life as well as natural and built environments. Focus on chemicals and additives in the selected product categories and damages caused by emissions/exposure during production, use, recycling and disposal.. Material Flow Analysis and resulting emissions/exposure together with all WPs - common basis for all project activities.

Task 2: Database related **to risk and loss of profitability** including a literature review and analysis of the socioeconomic effects of chemicals in products at the global level as well as the **policy instruments** to mitigate the impacts of risks. Includes a broad financial analysis of the full life cycle of selected product categories, to be used for the analysis of policy options.

Task 3: **Global Strategies** for Mitigation of socio-economic effects of chemicals in products including participation in **case studies** on the relation between risk and perceived risk related to chemicals.

Figure 1: Impact pathway approach



Impact pathway analysis

- Requires knowledge for all steps (MFA, Emissions, Exposure, Impacts and associated costs)
- Input from other WPs is critical!
- Need a common MFA for selected product categories. Simple at first, improved during project.
- Expected results:
  - Not full assessment of all additives in all product categories but
  - Good examples (selected products, additives, selected geograhical regions)
  - Conceptual methodology for full assessment
- - Databases on existing information
- Identification of gaps in knowledge and future areas for research

WP7 - Deliverables

Deliverables:

- D7.1. Metaanalysis on damage costs related to health, the built environment and the ecosystem
- D7.2. Database on relation between risk and loss of profitability
- D7.3. Literature review and analysis of the socioeconomic effect of chemical in products at the global level as well as the policy instruments to mitigate the impacts of risks
- D7.4. Participation in case studies to study relation between risk and perceived risk related to chemicals

WP7 - Milestones

- M7.1 Damage costs of chemicals in products (Month 17)
- M7.2 Database related to risk and loss of profitability (Month 23)
- M7.3 Global Strategies for Mitigation of socio-economic effects of chemicals (Month 29)

WP7 – Milestone 7.1

- **Damage costs** of chemicals including:

  -Damage to health and human life (e.g. death incidences, injuries, evacuation)

  -Natural environmental damage (i.e. biosphere, air, water, soil)

  -Built environment damage (e.g. warehouses, process equipment, utilities, vehicles, buildings)

WP7 – Milestone 7.2

- Database related to **risk and loss of profitability** including:

  -Literature review and analysis of the socioeconomic effects of chemicals in products at the global level as well as the policy instruments to mitigate the impacts of risks

WP7 – Milestone 7.3

- **Global Strategies** for Mitigation of socio-economic effects of chemicals including:

  -Participation in **case studies** to study the relation between risk and perceived risk related to chemicals

WP7 - Workplan

Task	Month	Staff
Damage costs	17	
-human health		
-Ecosystem		
-Built environment		
Policy instruments	23	
-Database related to risk and loss of profitability		
-Literature review and analysis of the socioeconomic effects of chemicals at the global level		
-Policy instruments to mitigate the impacts of risks		
Case studies	29	
-Global Strategies for Mitigation of socio-economic effects of chemicals		
-Participation in case studies on the relation between risk and perceived risk related to chemicals		

TECHNISCHE UNIVERSITÄT DRESDEN

European Project Center

FP7 project RISKCYCLE (226552)

Global Strategy for Risk Based Management

Work package 8

Objectives

- Identifying key elements to find a global strategy for risk based management (results of WP 2 to 7)
- → final project report

Deliverables
D.8.1. Key elements for global strategy for risk based management and identified gaps (Month 32)

Objectives

- Key elements:
  - Minimisation of risks
  - Harmonisation of global strategies referring to testing standards for chemicals and additives in products
  - Substitution of animal tests trough alternative tests in a long-term perspective
  - Installation and implementation of an interactive communication system of all concerned parties