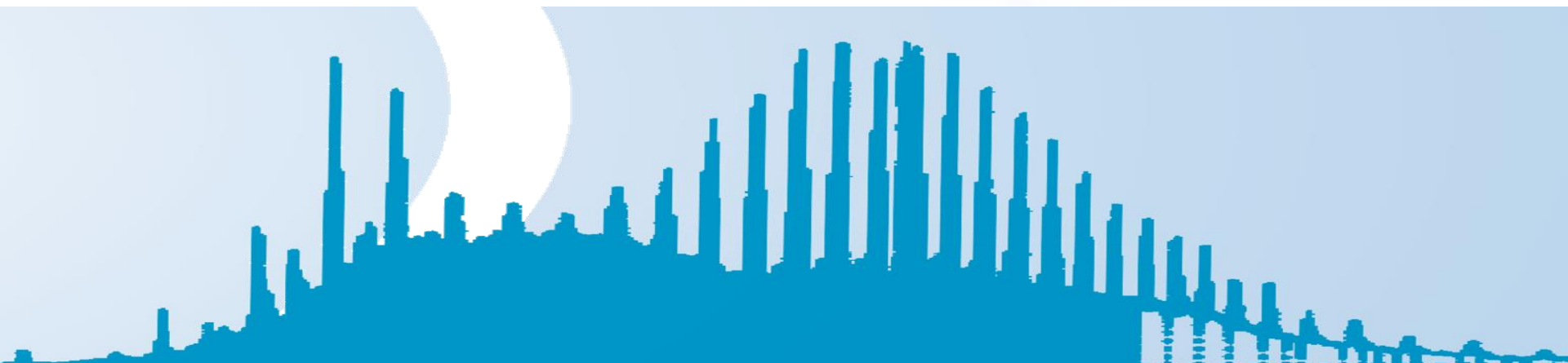
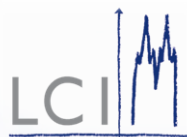


# Mineral oil hydrocarbons (MOSH/MOAH) in cocoa and cocoa products and possible minimization strategies



International Symposium on Cocoa Research  
13 – 17 November 2017 ♦ Lima/Peru



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Food Chemistry Institute of the Association of the German Confectionery Industries, Cologne/Germany  
Lebensmittelchemisches Institut des Bundesverbandes der Deutschen Süßwarenindustrie, Köln/Germany

# What you can expect...

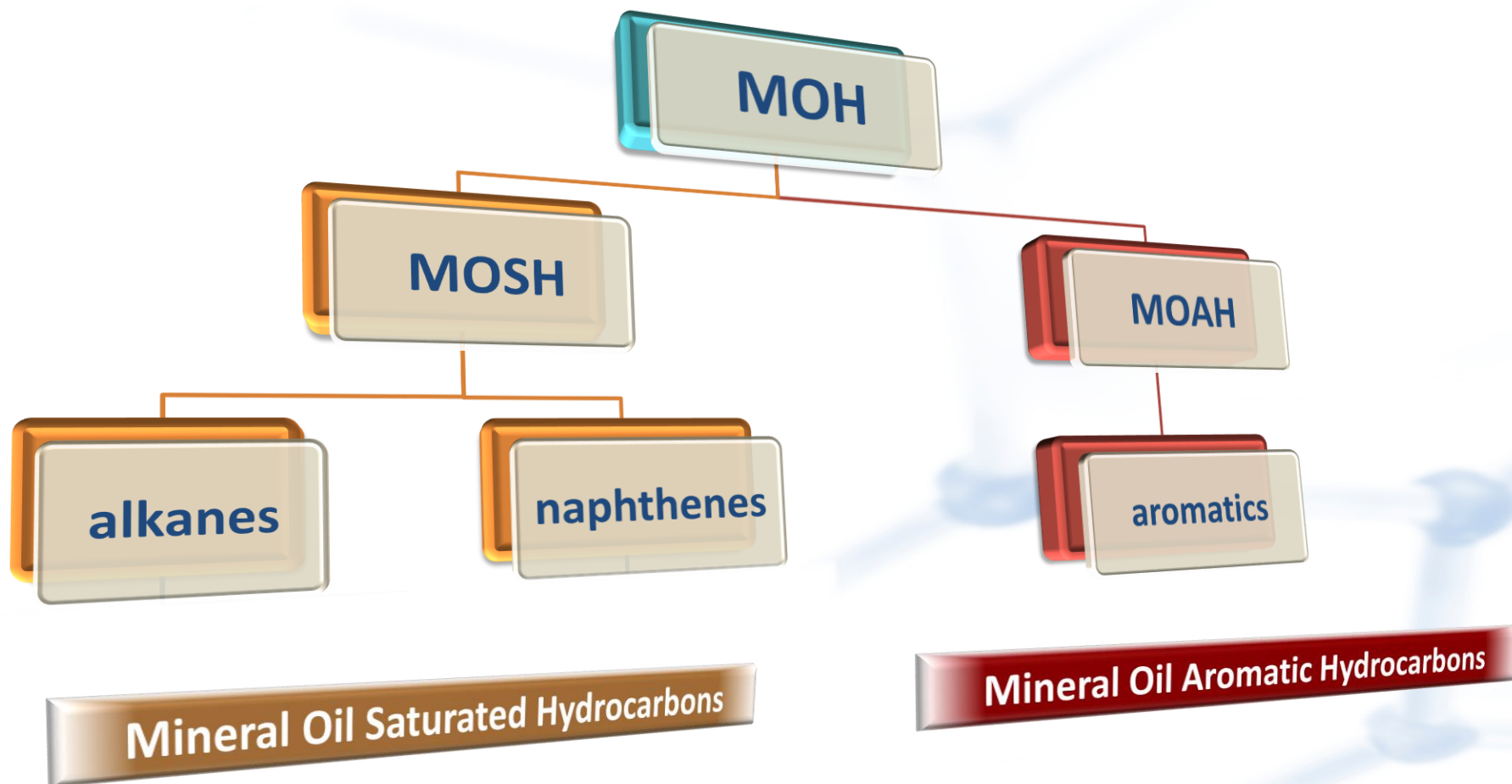
- A new Issue in Food Safety
- Research Findings
- Toolbox + Masterplan



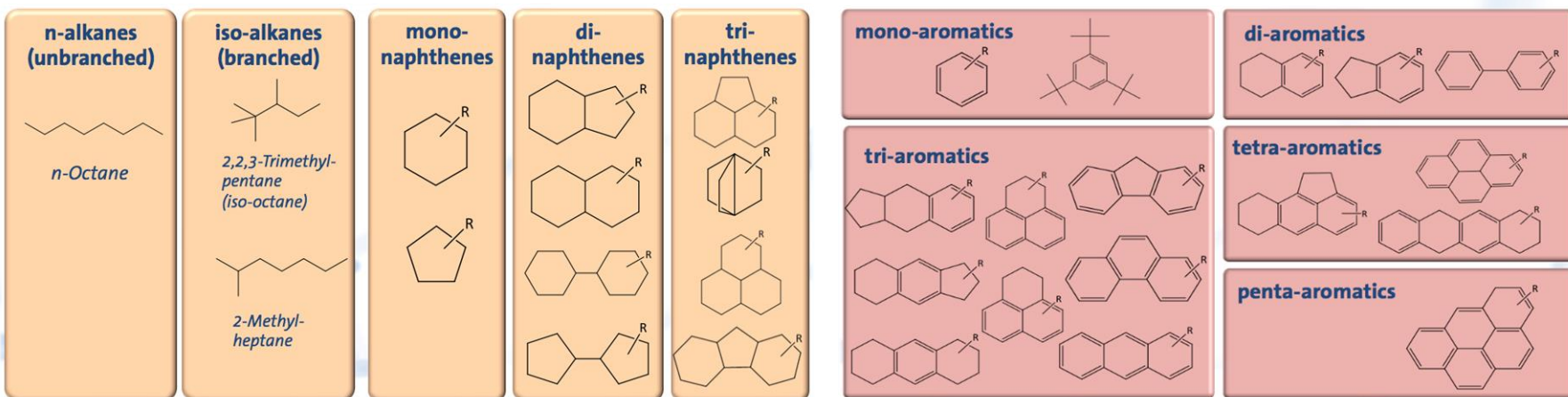
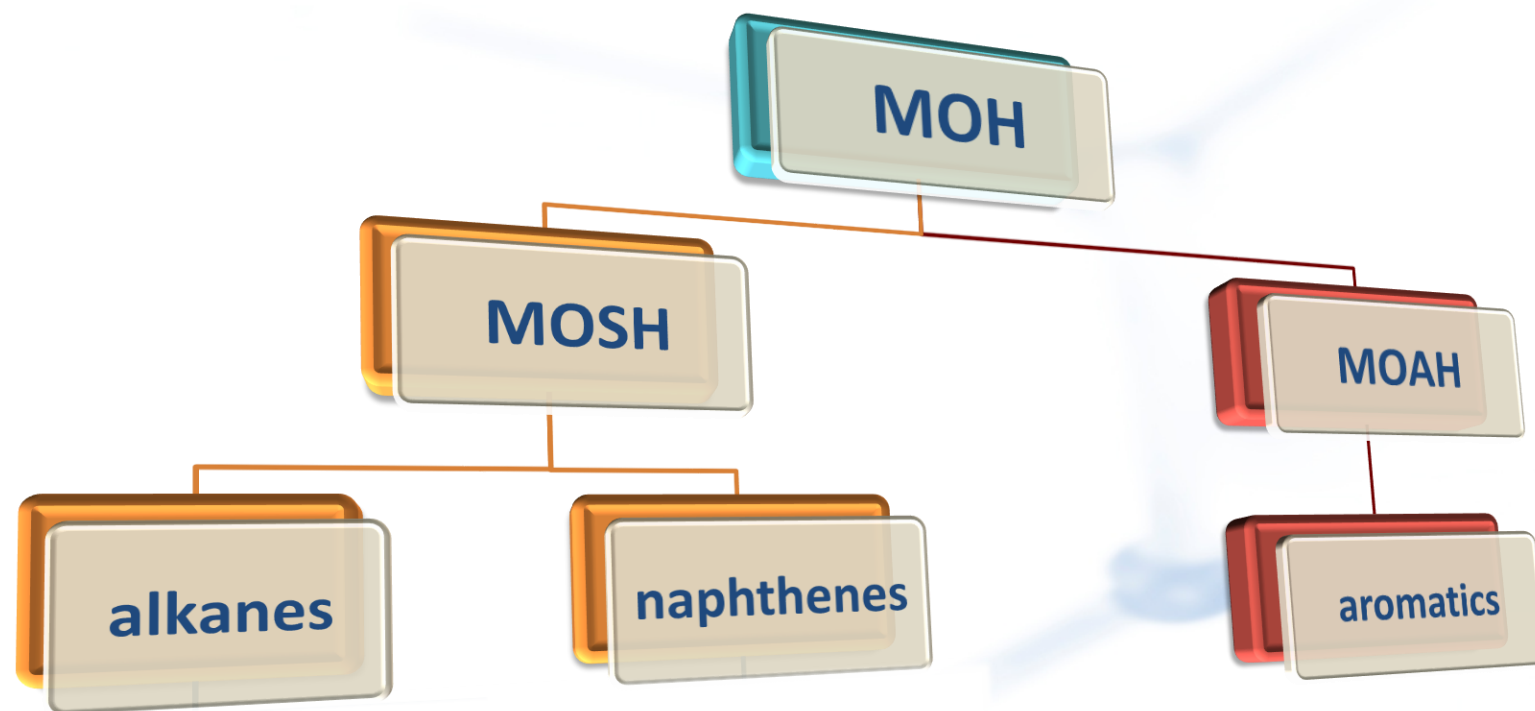


**What is MOSH/MOAH?**  
**How to analyze it?**

# Mineral Oil Hydrocarbons (MOH) – Categories

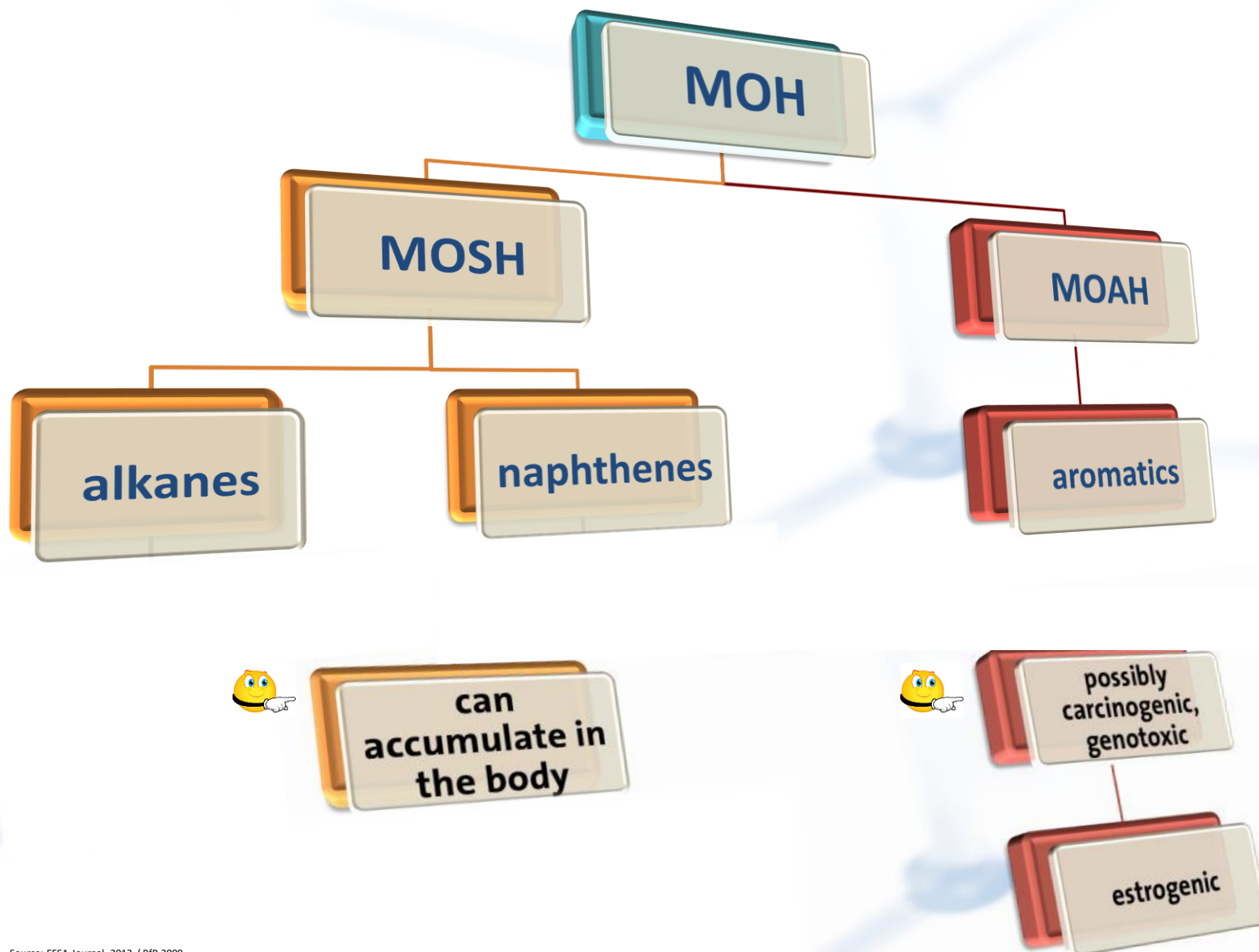


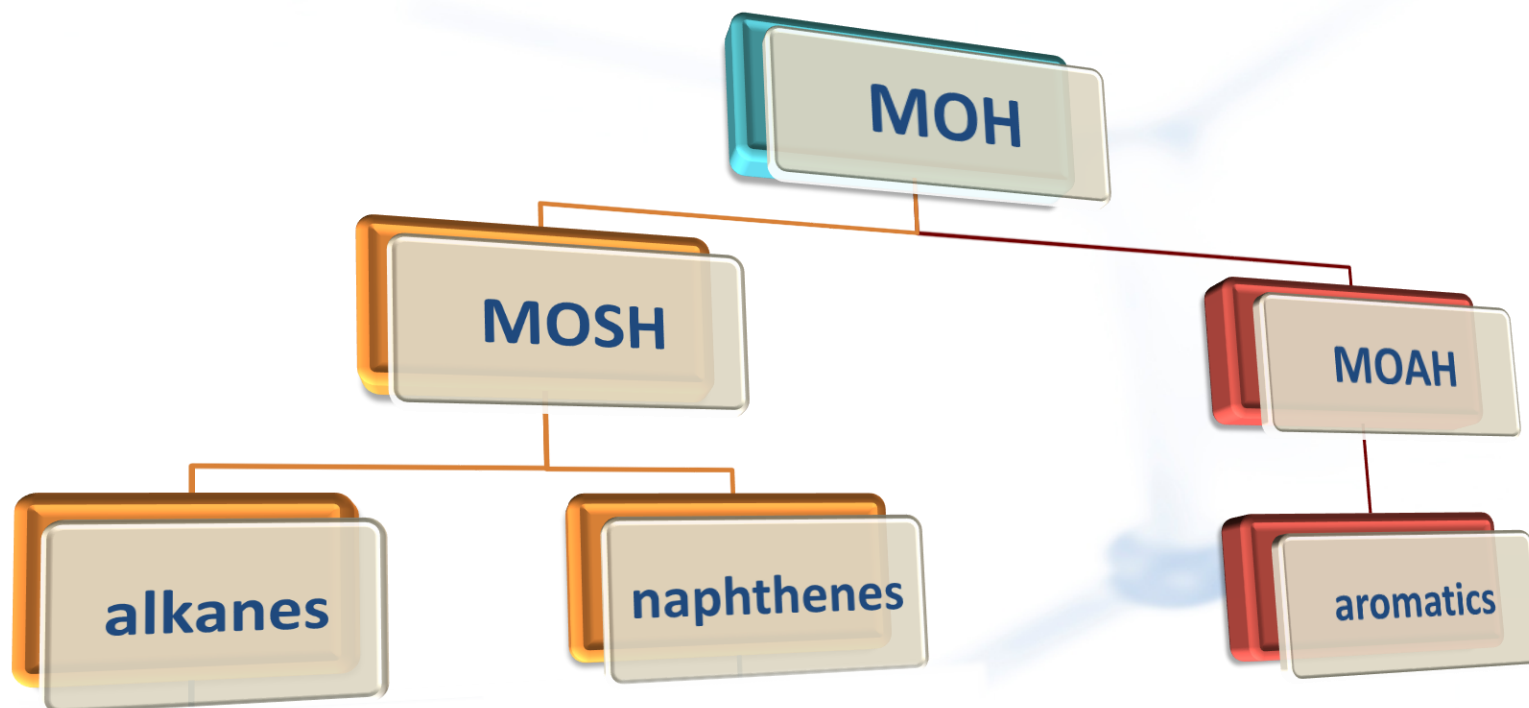
# Myriads of Compounds (Carbon Numbers 10 – 50) LCI





# MOH – Brief Toxicology





**Undesirable Substances in Foods!**

(EFSA European Food Safety Authority, 2012)



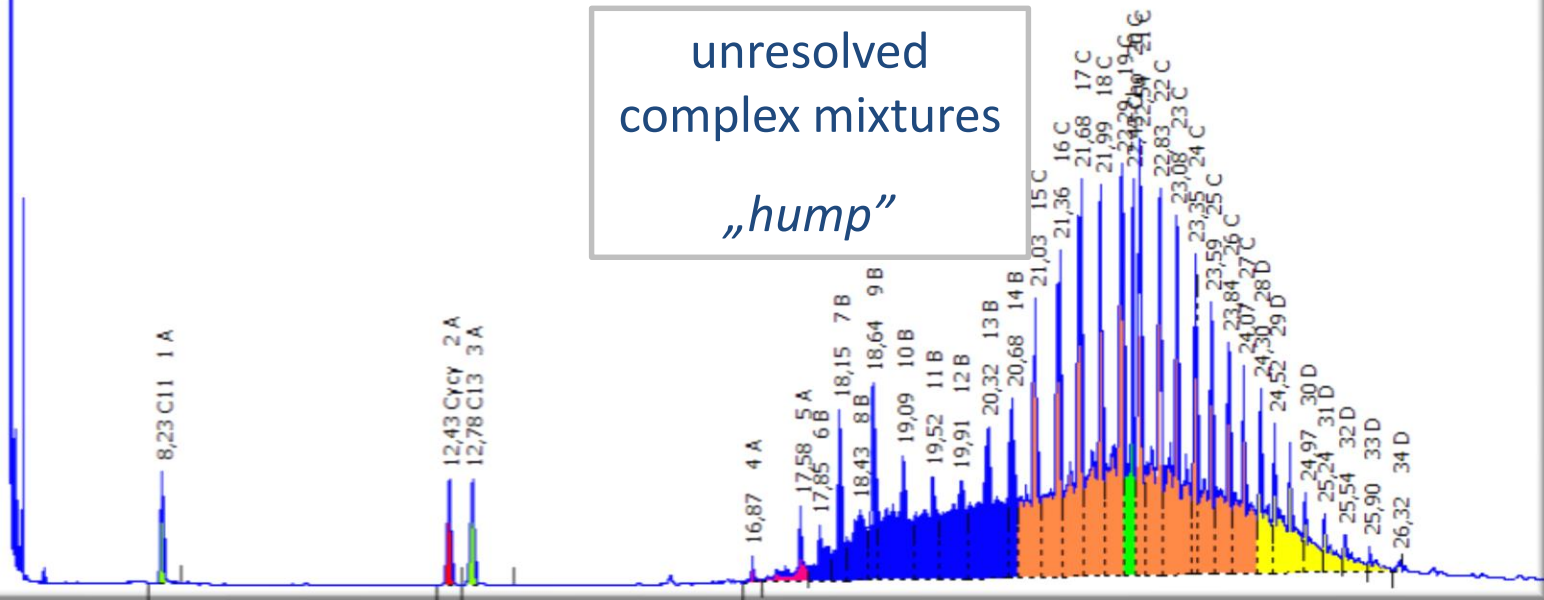
# *Quantitation of MOSH / MOAH contents*

online LC-GC-FID



unresolved  
complex mixtures

„hump“



online LC-GC-FID



European Committee for Standardization

## **DIN EN 16995:2017-08 (E)**

**Foodstuffs - Vegetable oils and foodstuff on basis of vegetable oils - Determination of mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH) with on-line HPLC-GC-FID analysis**

(MOAH) with on-line HPLC-GC-FID analysis  
of mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons  
Foodstuffs - Vegetable oils and foodstuff on basis of vegetable oils - Determination

DIN EN 16995:2017-08 (E)

online LC-GC-FID

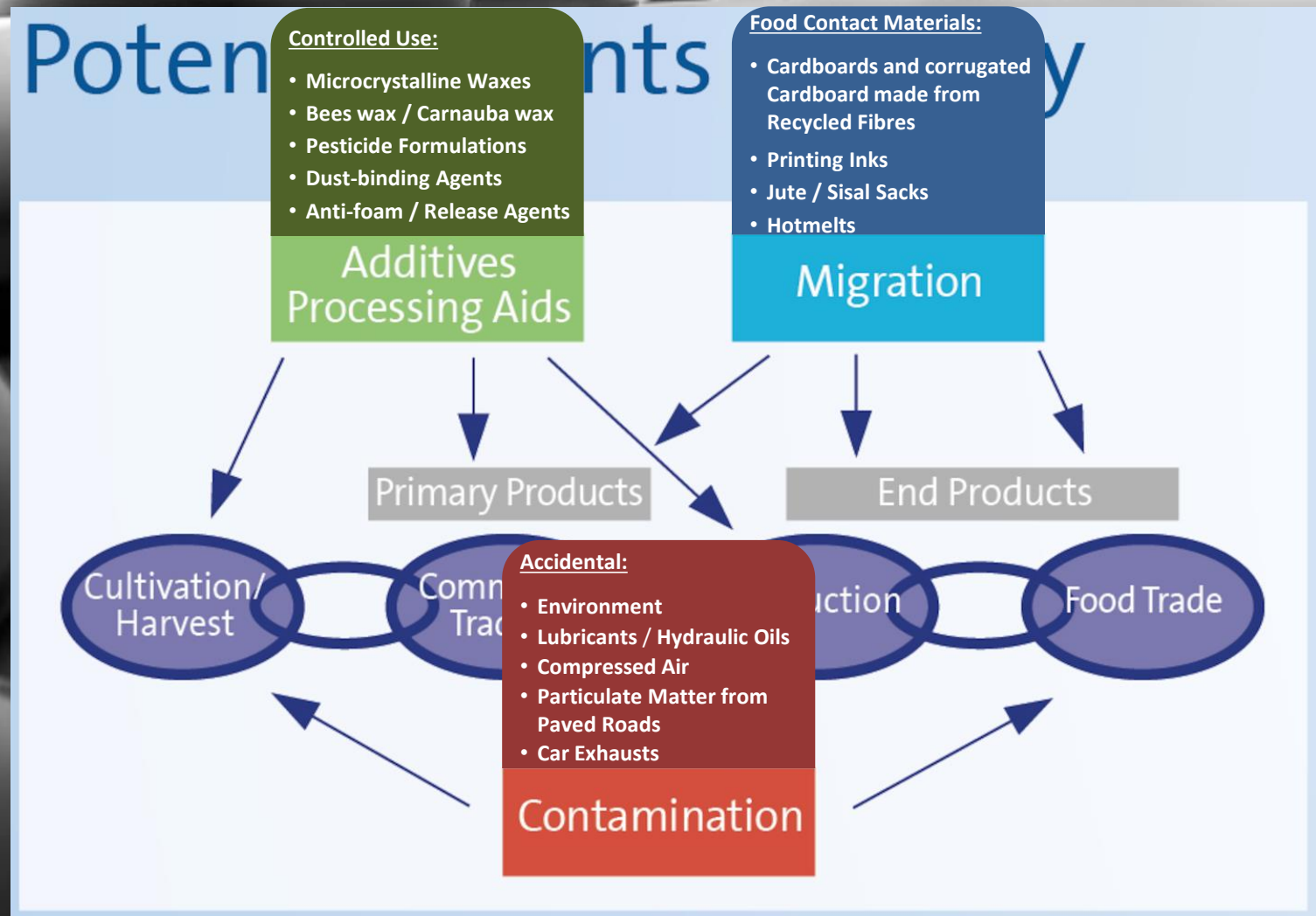


## LCI Research Findings

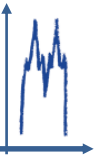
# Milestone 1: Systematic Approach



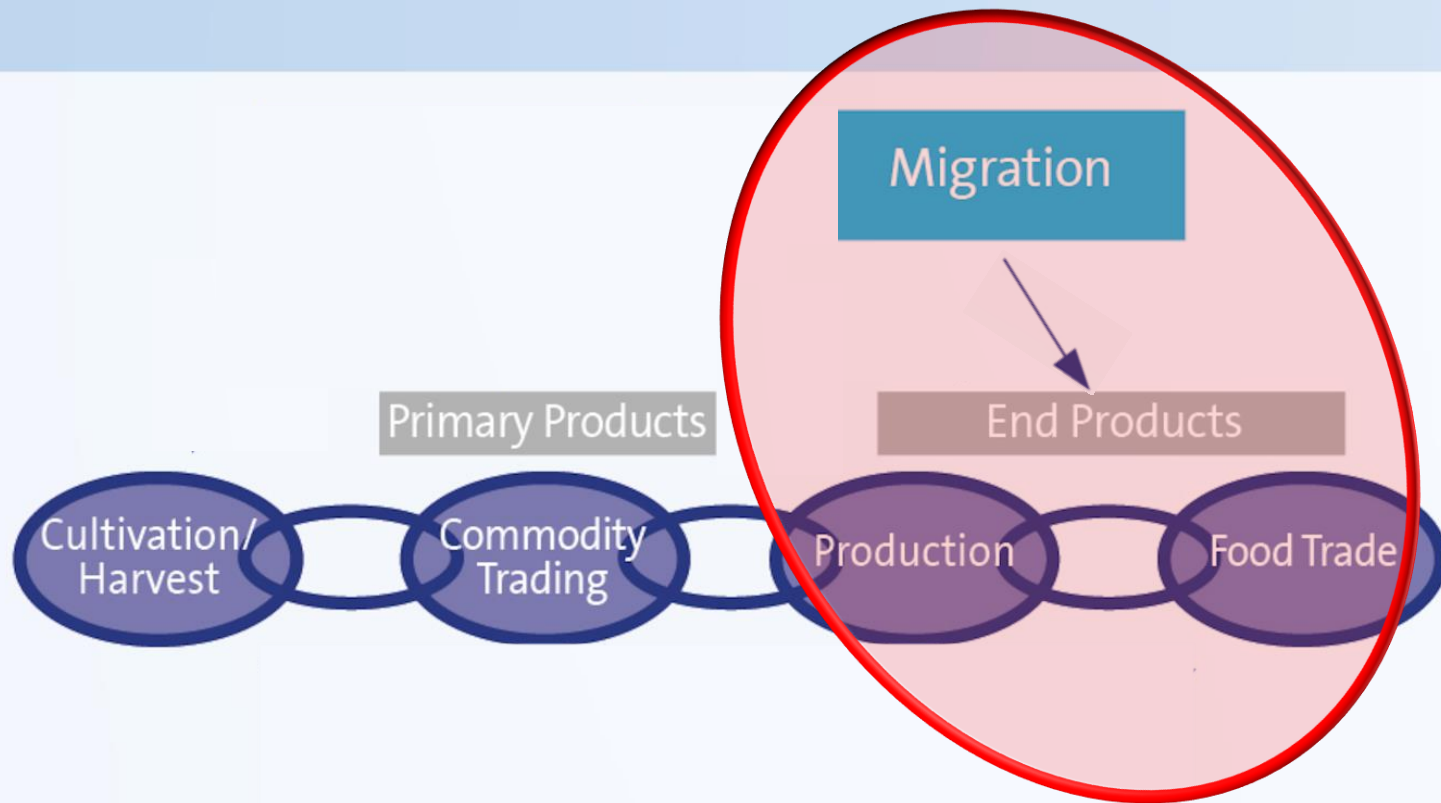
# Milestone 1: Systematic Approach







## Potential Points of Entry

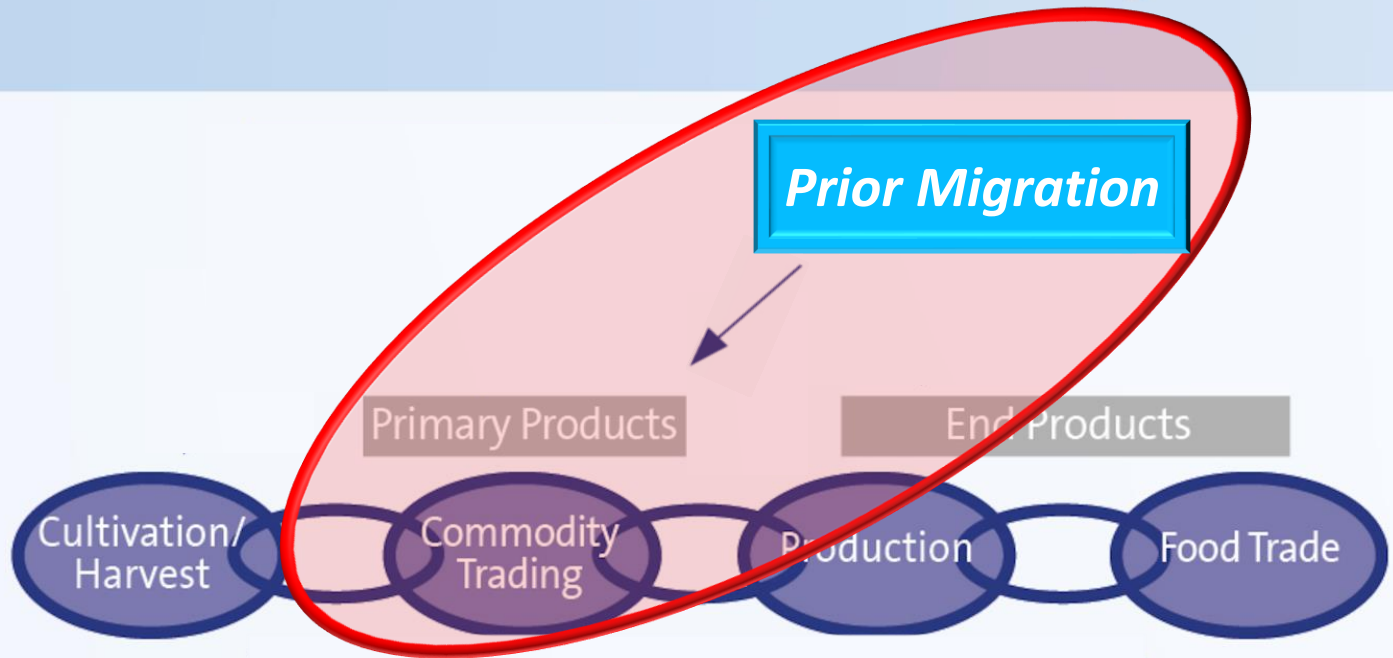


# Milestone 2: Prior Migration



# Milestone 2: Prior Migration

## Potential Points of Entry



### Identified Main Sources:

- Use of Recycled Cardbord
- Use of not really *mineral oil free* Bags (Jute, Inks)

# Migration *via* Gas Phase

Do not only take into account end products!

Beware of Commodities & Semi-Finished Products!





# Jute/Sisal Sacks

Critical review of „*Food Grade Quality*“  
according to *IJO Standard 98/01*:

- Quality parameter: „*Unsaponifiable Matter (USM)*“

*IJO International Jute Organisation*

- Our demand:

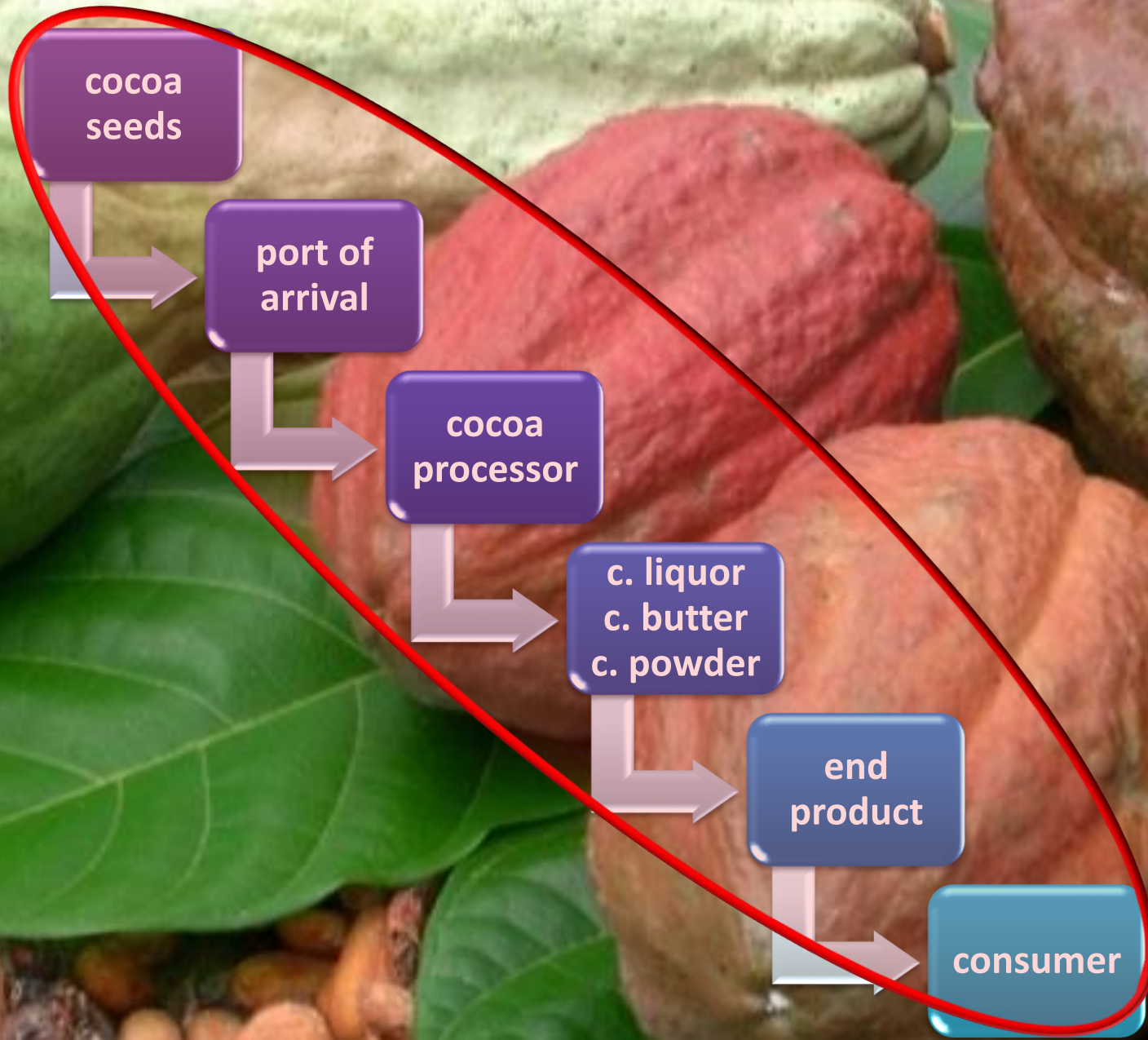
☞ **Batching Oils must be *free* from MOSH/MOAH!**



# Findings regarding Cocoa

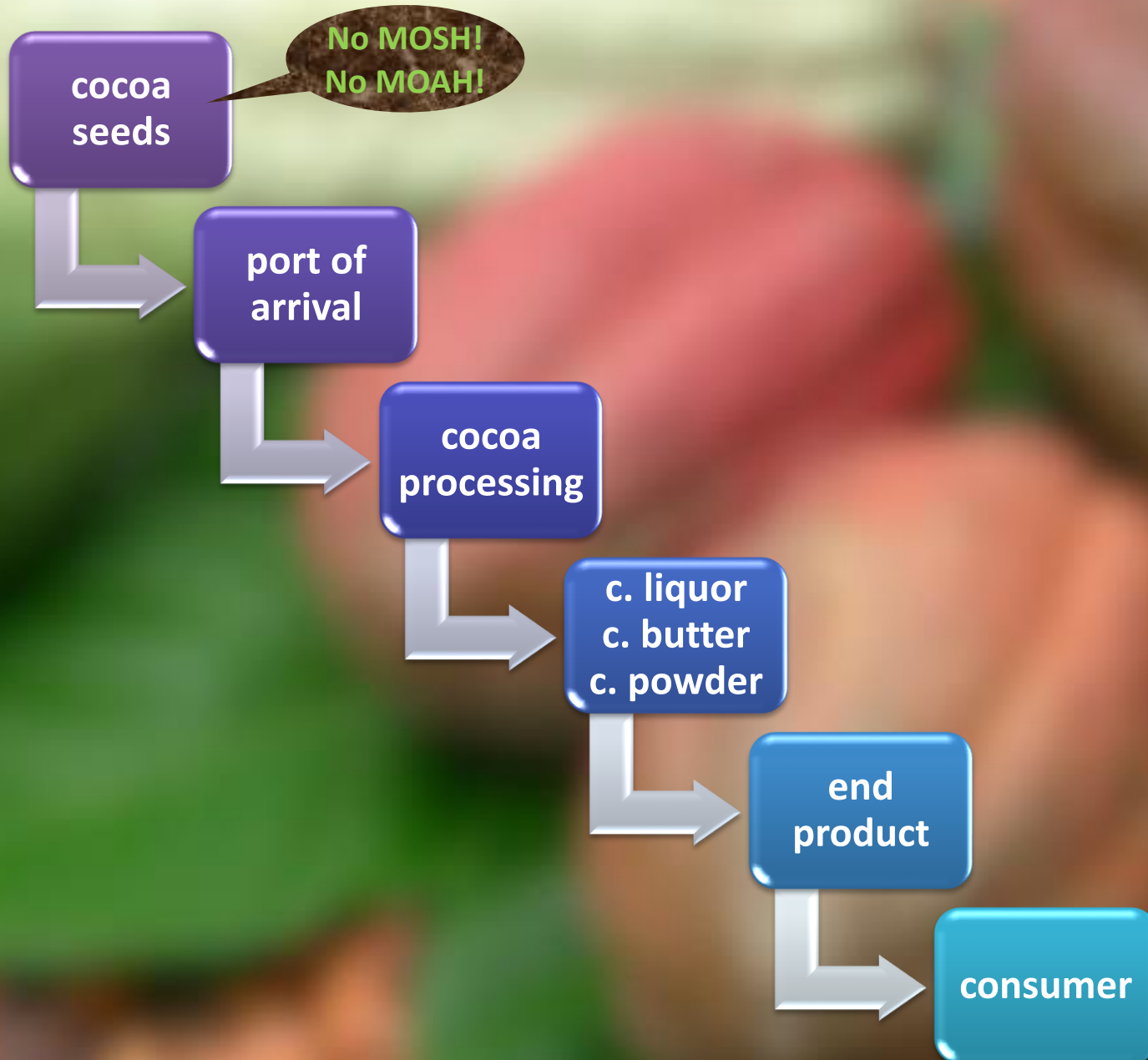


# From „Bean to Bar“

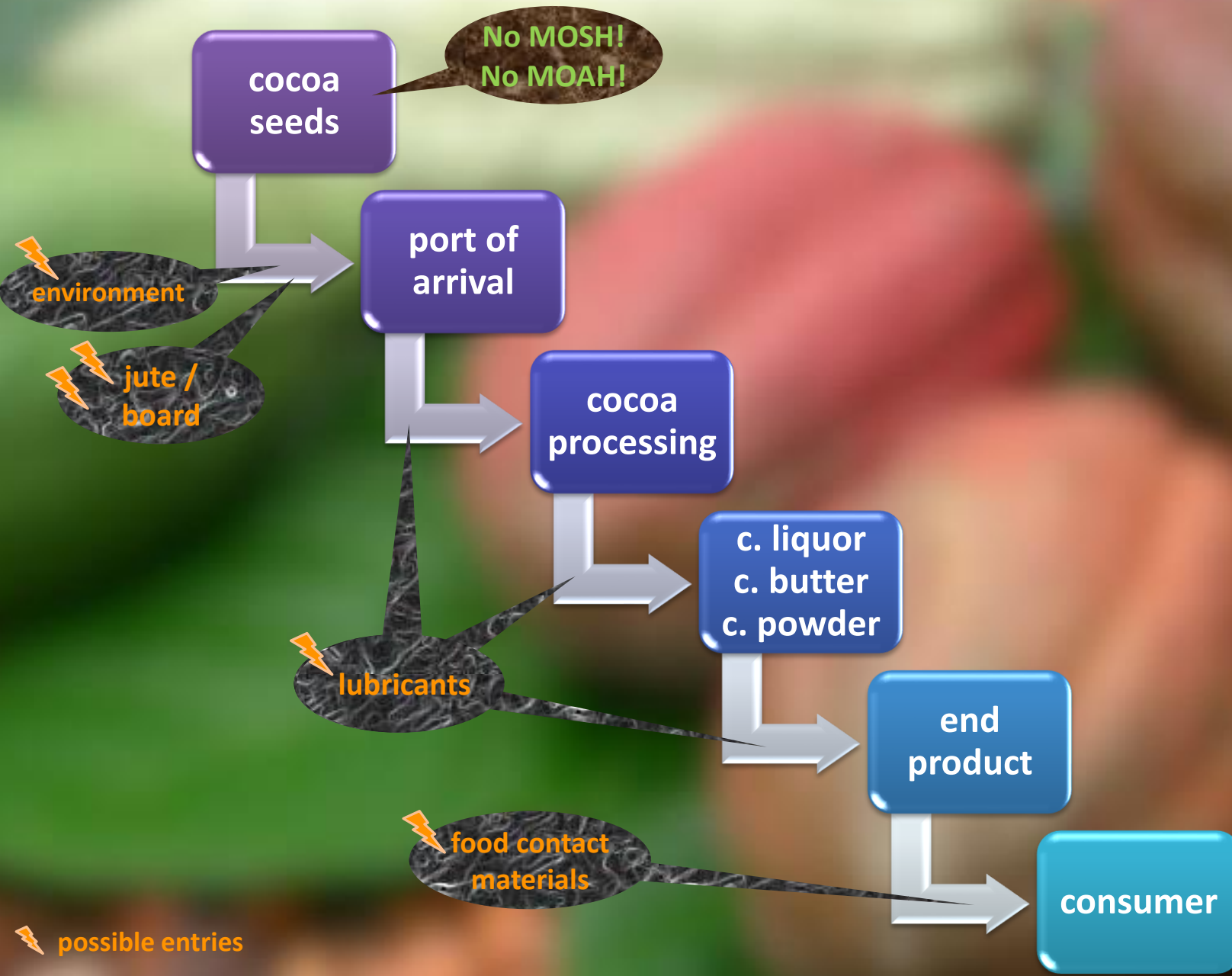




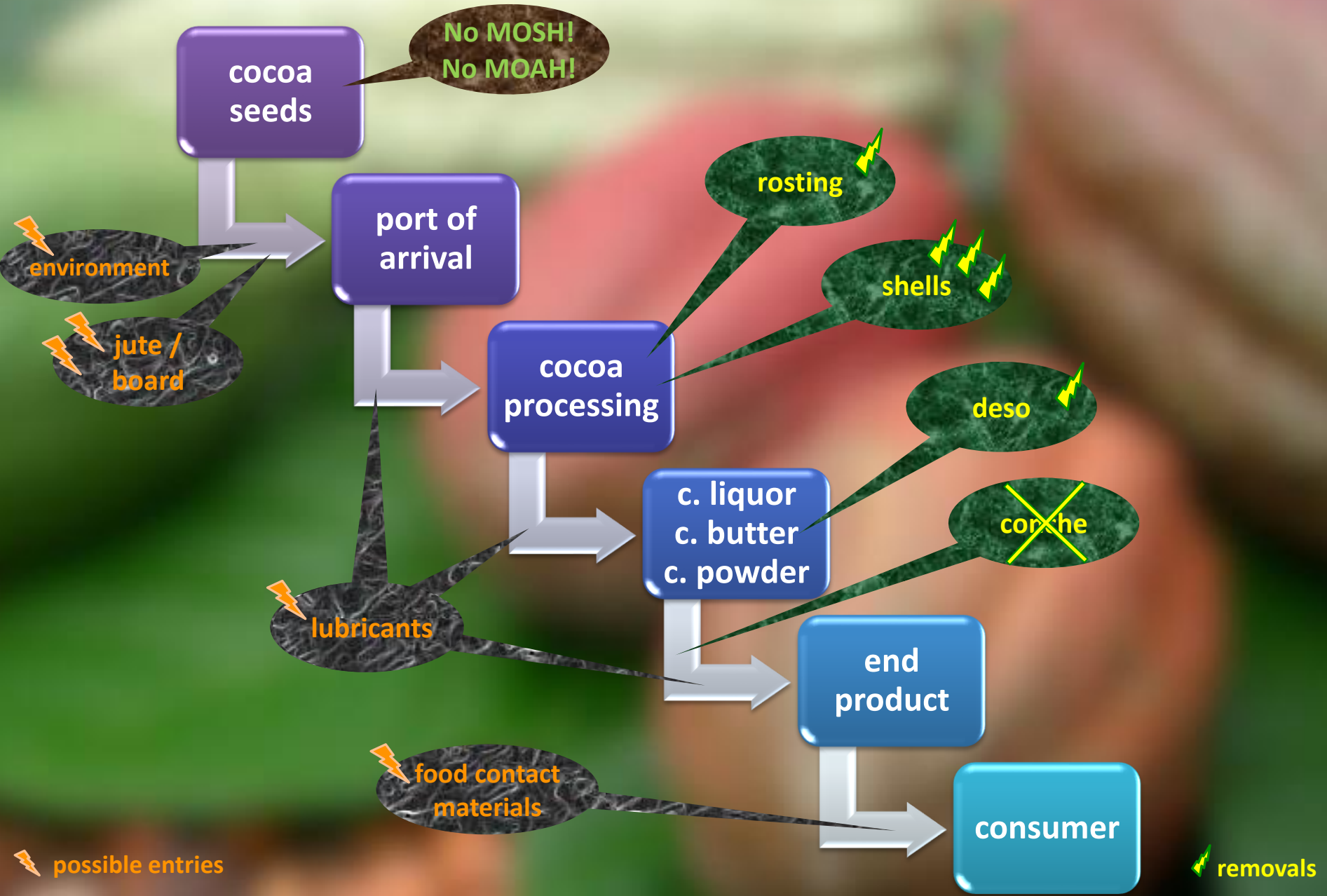
# From „Bean to Bar“



# From „Bean to Bar“



# From „Bean to Bar“



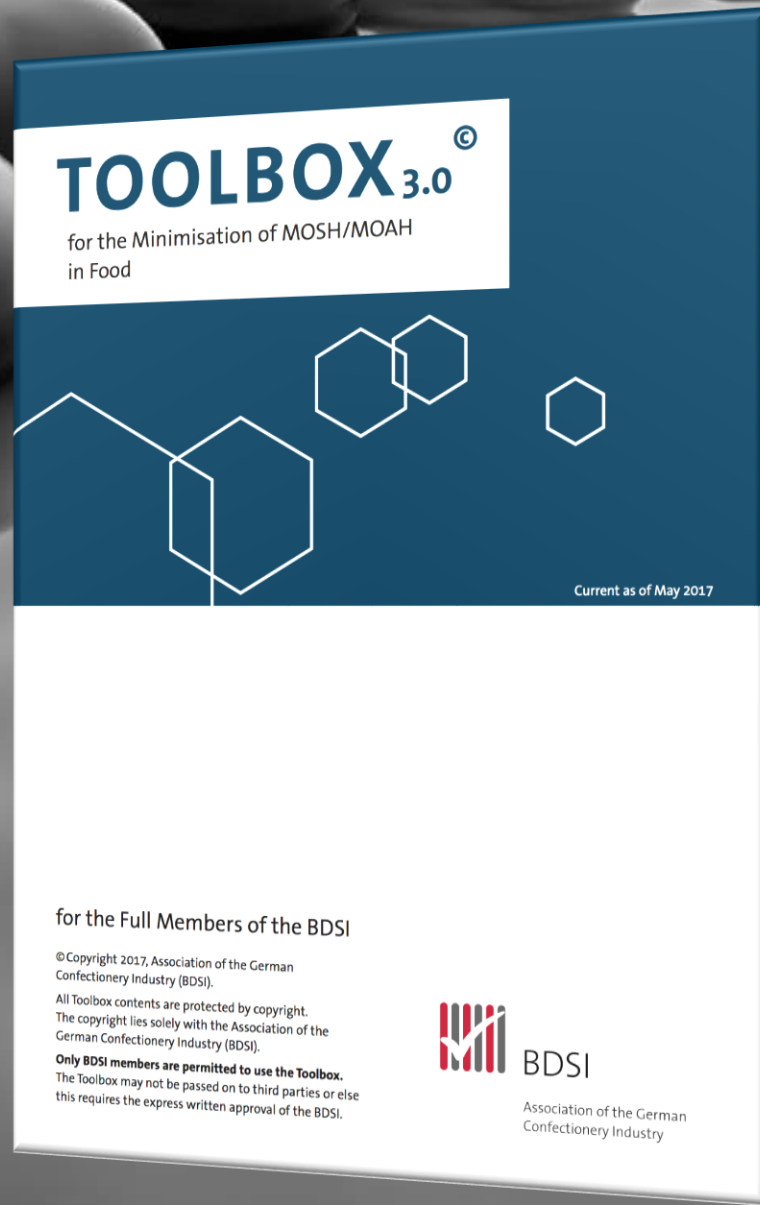


## Toolbox + Masterplan

# Milestone 3: Toolbox



# Milestone 3: Toolbox



## TOOLBOX<sup>3.0</sup> ©

for the Minimisation of MOSH/MOAH  
in Food

Current as of May 2017

for the Full Members of the BDSI

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The Toolbox may not be passed on to third parties or else  
this requires the express written approval of the BDSI.



BDSI

Association of the German  
Confectionery Industry

# Milestone 4: The Master Plan

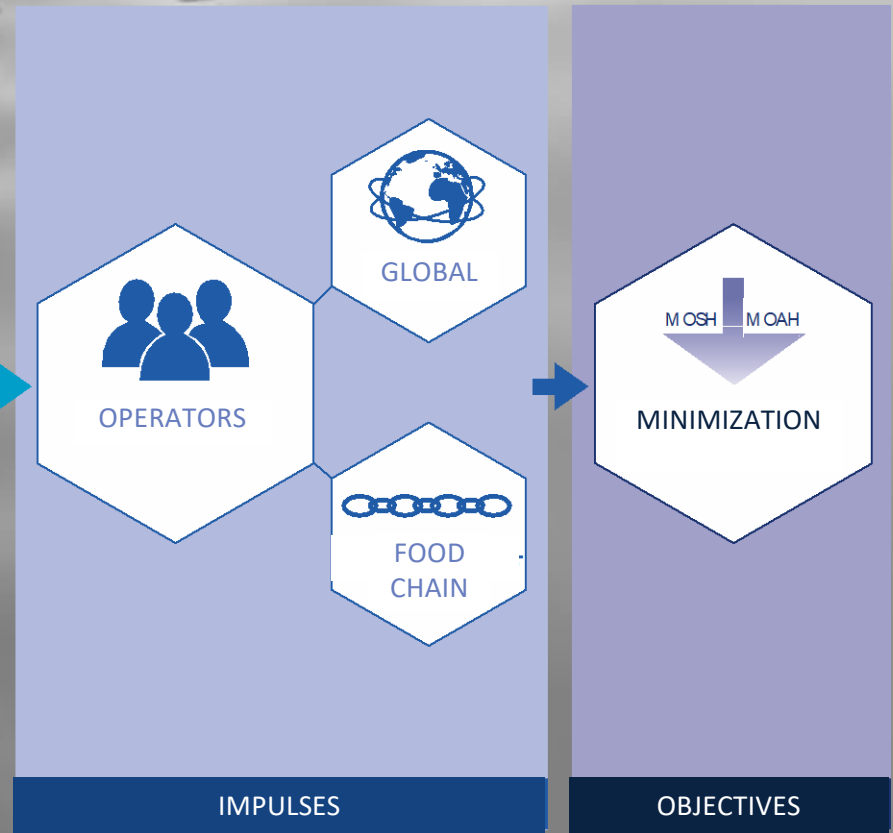


# Milestone 4: The Master Plan

## 1<sup>st</sup> Part: Research Work



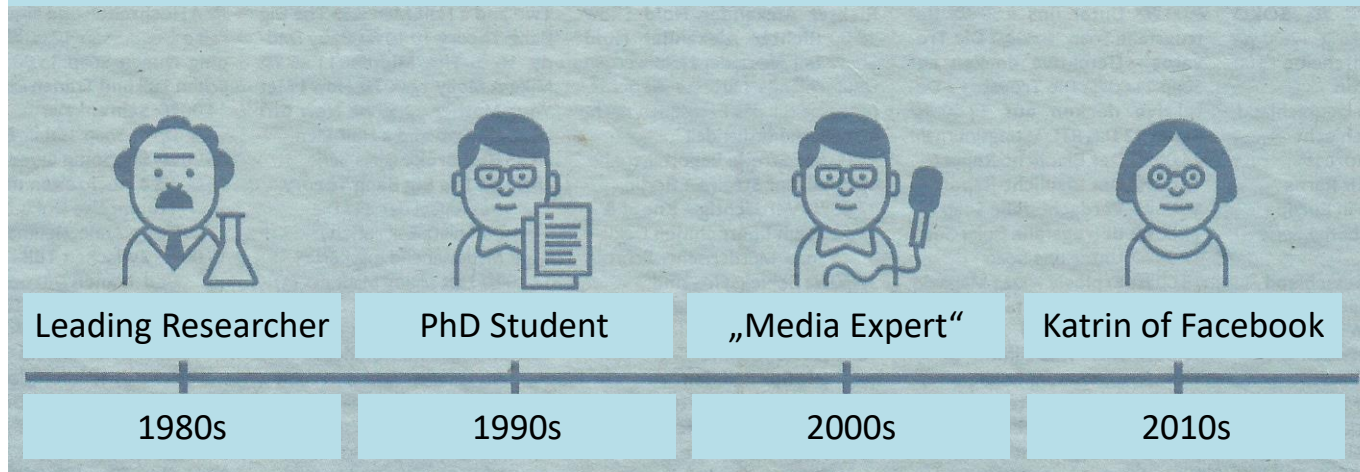
## 2<sup>nd</sup> Part: Implementation Work





- ✧ The entry of MOSH/MOAH in foods (cocoa) is a very complex issue!  
The entire value chain must be considered!
- ✧ The toolbox can help industry to understand and mitigate entries!
- ✧ MOSH and MOAH should be minimized as undesirable contamination!
- ✧ The main contamination with cocoa comes from recycled cardboard and from not really *MOSH/MOAH-free* jute sacks!
- ✧ A *Minimization Concept* seems meaningful and should be encouraged!

## Recognized experts as time goes on...



**Thank you for your attention!**

[www.lci-koeln.de](http://www.lci-koeln.de)