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CONTRIBUTION OF DOMESTIC WATER TO URBAN POLLUTANT FLOWS: CHARACTERIZATION AND SOLUTIONS FOR SOURCE CONTROL

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INTRODUCTION

Emerging contaminants are of increasing concern in megacities due to their wide utilization in all the field of anthropic activities (industries, building materials, household products, pharmaceuticals and personal care product), their ubiquity in air and urban waters, and their potential negative effect on health and aquatic ecosystems (as endocrine disruptors or induction of antibiotic resistance). The implementation of wastewater treatment plants with advanced treatments makes possible to limit discharges to the environment. But these expensive solutions do not allow to manage all the flows (stormwater, combined sewer overflows or persistent contaminants). The aim of our work was to promote reduction actions at source in order to limit the flows entering wastewater treatment plants and to reflect on the role of users and local authorities.

INDUSTRIAL VS. DOMESTIC CONTRIBUTION IN WASTEWATER

- Domestic concentrations ≈ Industrial concentrations
- Domestic loads >> industrial loads

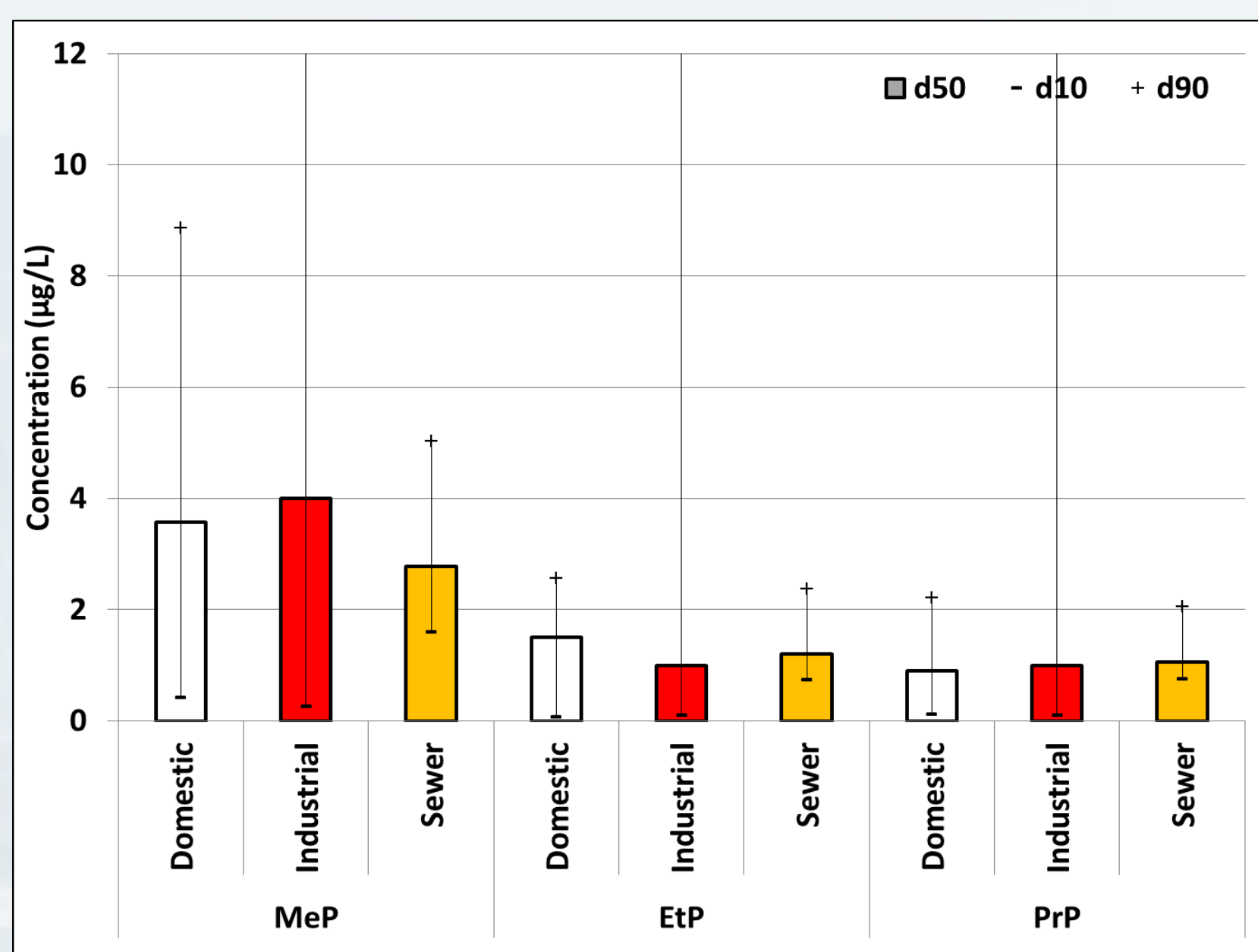


Fig. 1: Concentrations of Methylparaben (MeP), ethylparaben (EtP) and propylparaben (PrP) in domestic and industrial wastewater and in sewer trunks

MODIFICATIONS OF INDUSTRIAL FORMULATIONS

- Emergence of “paraben free” products (Cf. Fig. 2)
- Substitution of parabens (Cf. Fig. 2)
- Emergence of “organic cosmetic” products

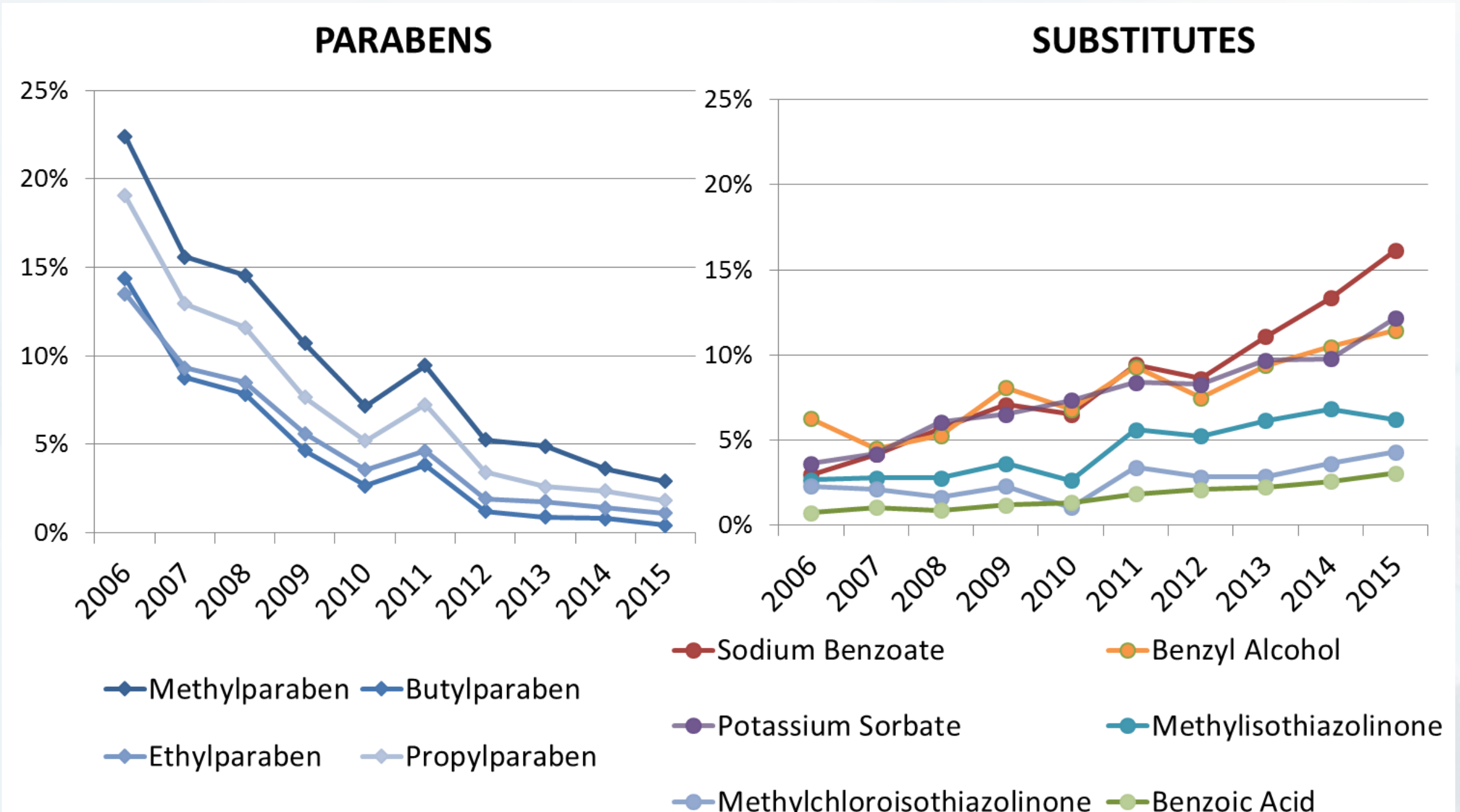


Fig. 2: Evolution since 2006 of yearly marketed cosmetics containing parabens (on the left) and substitutes (on the right) [Mintel database, 2015]

SUBSTITUTION OF PARABENS VS. WASTEWATER QUALITY

- The main Parisian sewer trunks were sampled before and after the change in consumption practices
- Around 10 millions inhabitants => representative of Paris conurbation
- Four sampling campaigns in 2009-2010 (n=28)
- Five sampling campaigns in 2015-2016 (n=36)

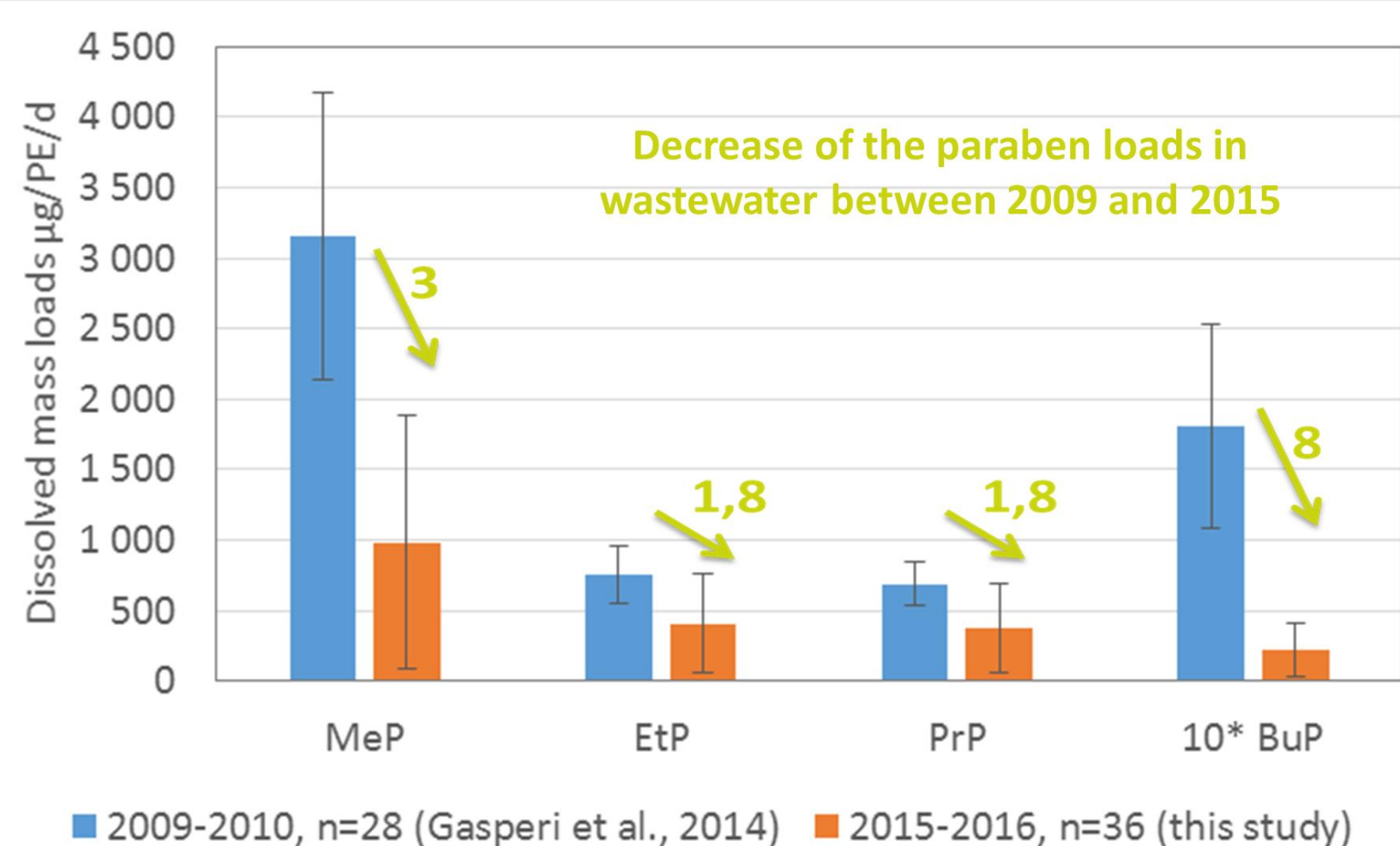


Fig. 3: Evolution of parabens mass loads in wastewater between 2009 and 2015

- Strong decrease of the cosmetic containing parabens led to a decrease from a factor 2 to 8 of the paraben fluxes in wastewater (Fig. 3)

HOW TO CHANGE CONSUMING PRACTICES

- The consumer survey (143 people surveyed at home in 2015)
- “Are there any risks associated with cosmetics?": Yes: 121, No: 18, Don't know: 4

The risks associated with cosmetics

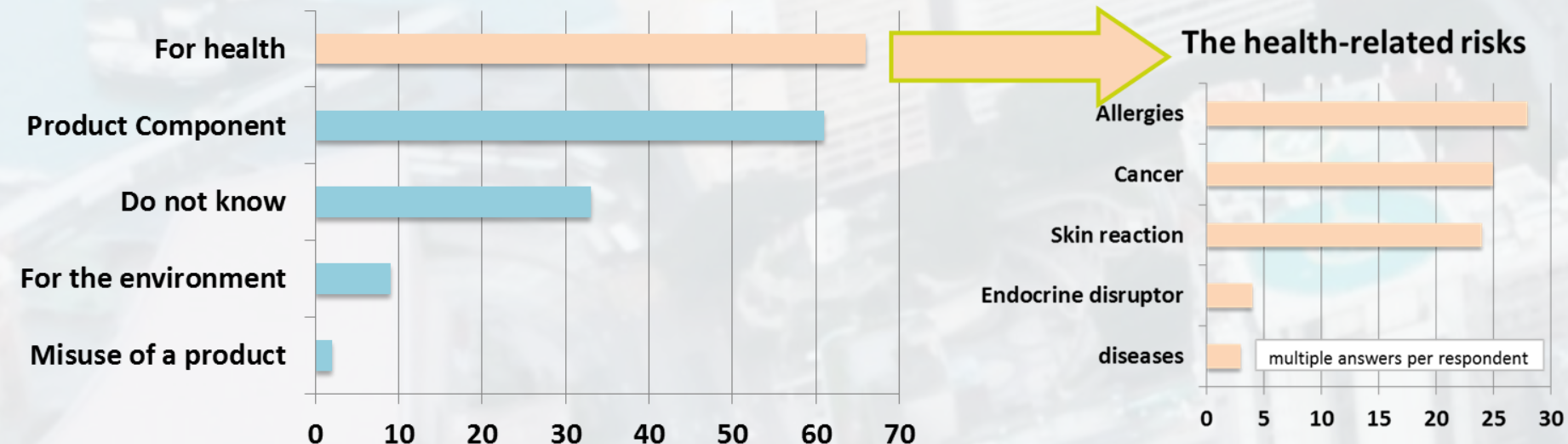


Fig. 3: Response at the consumer survey (number of responses on 143)

- Interview of concerned consumers

- Changes in consumptions practices are mostly due to the change in the cosmetic supply
- Raising public awareness of the links between domestic activities, exposure to substances and impact on the environment

CONCLUSION

In the case of the Paris conurbation, heavily urbanized and scarcely industrialized, we highlighted that paraben contamination of domestic wastewater is predominant compared to industrial wastewater. The paraben alert was essentially a sanitary alert that led to the emergence of a new industrial market. This change in the cosmetic supply was the major driver of the changes in consumption practices, which seemed suffered by the consumers and not conscientiously chosen. However, the strong decrease of the cosmetics containing parabens led to a decrease from a factor 2 to 8 of the paraben fluxes in wastewater. Suffered or chosen, from regulation or from new industrial marketing, the change in consumption practices is a promising way to reduce micropollutants in urban water. The next step is to provide policy instruments for local authorities aiming at building effective strategies to promote micropollutant source reduction.

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