# Solutions & discussion

| | | | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 | Guide solution |
|---|---|---|---|---|---|---|---|---|---|
| Ex 1 | Full Impact | | 3 | 3, 4 | 3 | 3 | 3 | 3 | ■■■ |
| | Partial Impact | | 3 | 3, 4 | 3 | 3 | 3 | 3, 1.5 | ■■■ |
| | Receptor contribution | | 4 | 4, 4 | 4 | 4 | 4 | 4 | ■■■■ |
| | Tagging contribution | | 3 | 3, 4 | 3 | 3 | 3 | 3, 4 | ■■■ |
| | Increment | | 2 | 2, 2 | 2 | 2 | 2 | 2 | ■■ |
| | | | | | | | | | |
| Ex 2 | Impact of a transport reduction of 50% | Impacts (50%) | 30 | 30 | 30 | 30 | 30 | 45(15) | 30% |
| | | Tagging | 17.5 | 17.5 | 17.5 | 17.5 | 17.5 | 17.5 | Unknown |
| | | Receptor | 10-60 | 10-35 | 22.5 | 10+? | 10-60 | 20(10) | Unknown |
| | Impact of a transport reduction of 75% | Impacts (50%) | 45 | | 45 | 45+? | not possible | same·1.25 | Unknown |
| | | Tagging | 52.5 | | 26 | 26.25 | 26.25 | same·1.25 | Unknown |
| | | Receptor | 15-65 | | 26 | 15+? | 15-65 | same·1.25 | Unknown |

OK

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| | | | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 | **Guide solution** |
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| | Tagging contribution | | 3 | 3, 4 | 3 | 3 | 3 | 3, 4 | ■■■ |
| | Increment | | 2 | 2, 2 | 2 | 2 | 2 | 2 | ■■ |
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| Ex 2 | Impact of a transport reduction of 50% | Impacts (50%) | 30 | 30 | 30 | 30 | 30 | 45(15) | 30% |
| | | Tagging | 17.5 | 17.5 | 17.5 | 17.5 | 17.5 | 17.5 | Unknown |
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| | | Tagging | 52.5 | | 26 | 26.25 | 26.25 | same·1.25 | Unknown |
| | | Receptor | 15-65 | | 26 | 15+? | 15-65 | same·1.25 | Unknown |

not OK

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|---|---|---|---|---|---|---|---|---|---|
| Ex 1 | Full Impact | | 3 | 3, 4 | 3 | 3 | 3 | 3 | [redacted] |
| | Partial Impact | | 3 | 3, 4 | 3 | 3 | 3 | 3, 1.5 | [redacted] |
| | Receptor contribution | | 4 | 4, 4 | 4 | 4 | 4 | 4 | [redacted] |
| | Tagging contribution | | 3 | 3, 4 | 3 | 3 | 3 | 3, 4 | [redacted] |
| | Increment | | 2 | 2, 2 | 2 | 2 | 2 | 2 | [redacted] |
| | | | | | | | | | |
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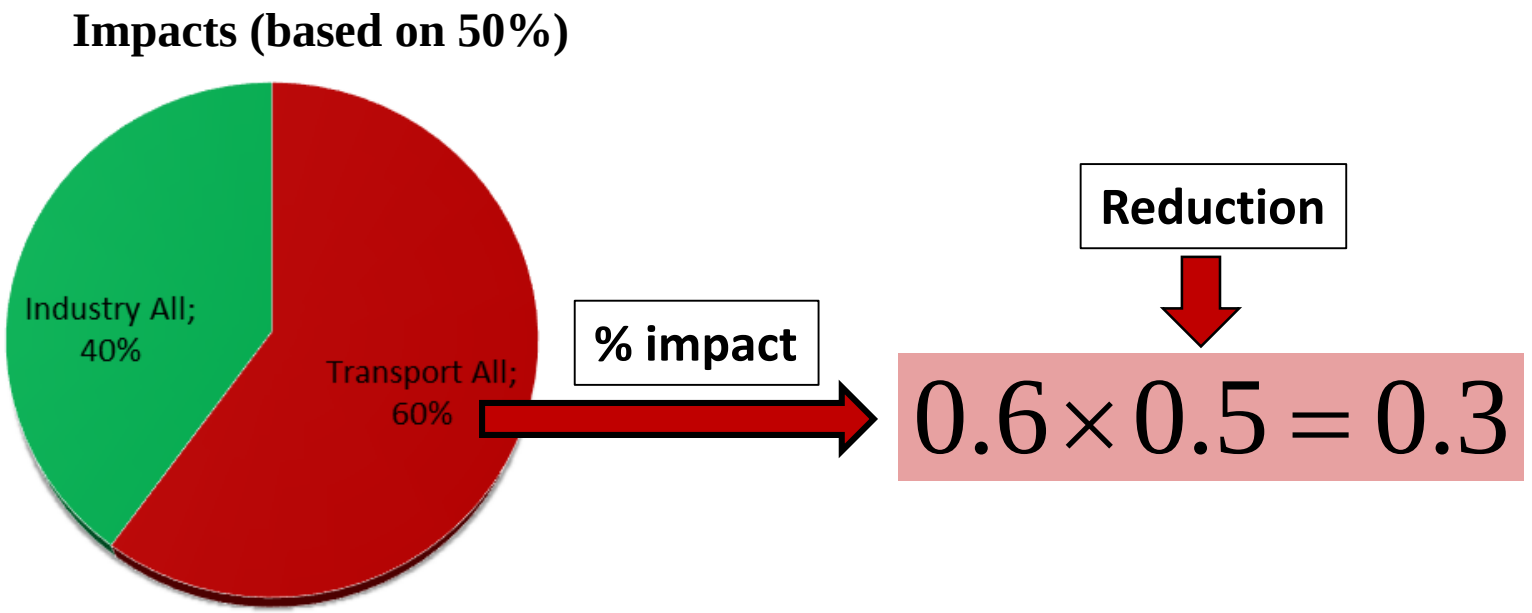
| | | Receptor | 15-65 | | 26 | 15+? | 15-65 | same·1.25 | Unknown |

# Impacts

In Madrid, 3 research groups used 3 different Source Apportionment methods to evaluate the source of PM2.5




1. What is the PM2.5 concentration reduction that Madrid would achieve if **transport emissions are reduced by 50% reduction** with the 3 methods?

| | | | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 | **Guide solution** |
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# Impacts

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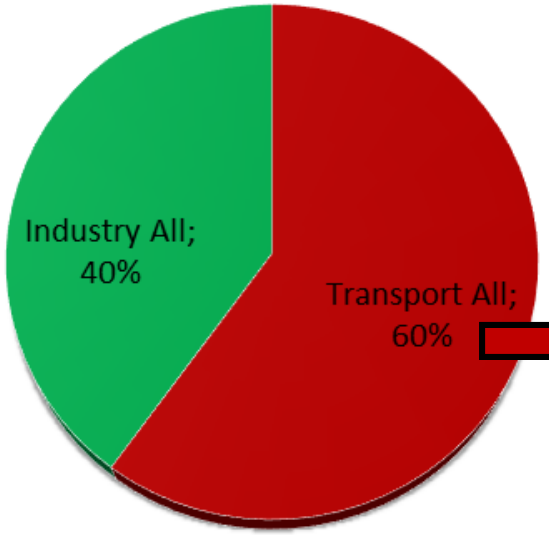
**Impacts (based on 50%)**




**% impact**

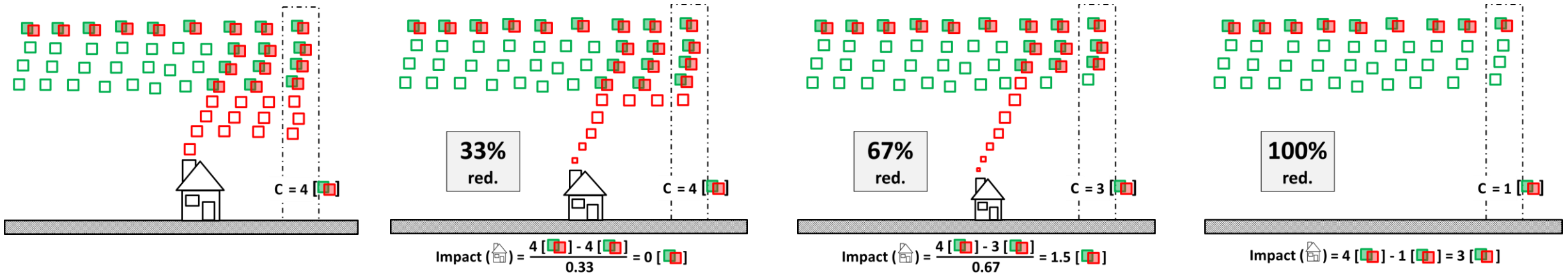
**Reduction**

$$0.6 \times 0.75 = 0.45$$

**Given that these sectors involve non linear species we can not make a linear extrapolation beyond 50% reduction**

2. **Same question with 75%**

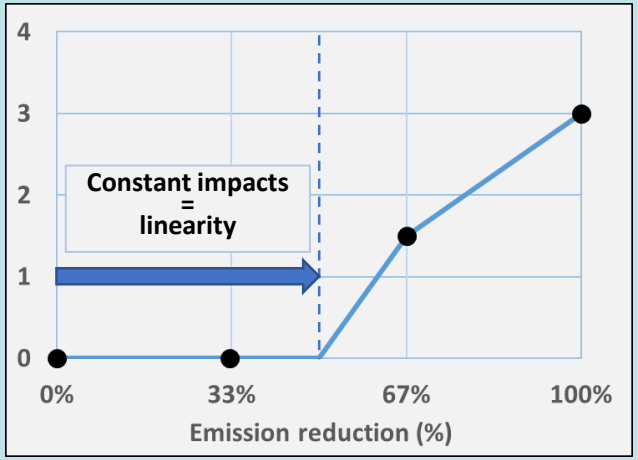
# Linearity of the impacts




$NO_2$ *Nitrogen dioxide*

$NH_3$ *Ammonia*

$\Rightarrow PM[NH_4NO_3]$ *Ammonium nitrate*



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| | Receptor contribution | | 4 | 4, 4 | 4 | 4 | 4 | 4 | ■■■■ |
| | Tagging contribution | | 3 | 3, 4 | 3 | 3 | 3 | 3, 4 | ■■■ |
| | Increment | | 2 | 2, 2 | 2 | 2 | 2 | 2 | ■■ |
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# Tagging

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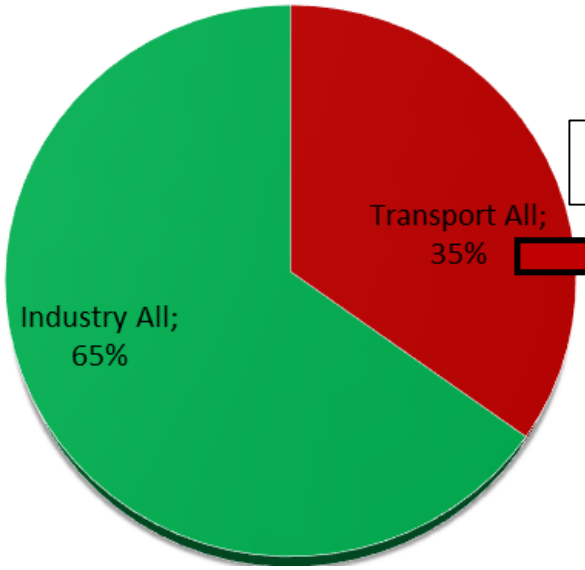
**Tagging contributions**




**% contribution**

**Reduction**

$$0.35 \times 0.5 = 0.175$$

**Tagging contributions are not equal to impacts for non linear species**

1. What is the PM2.5 concentration reduction that Madrid would achieve **if transport emissions are reduced by 50% reduction** with the 3 methods?

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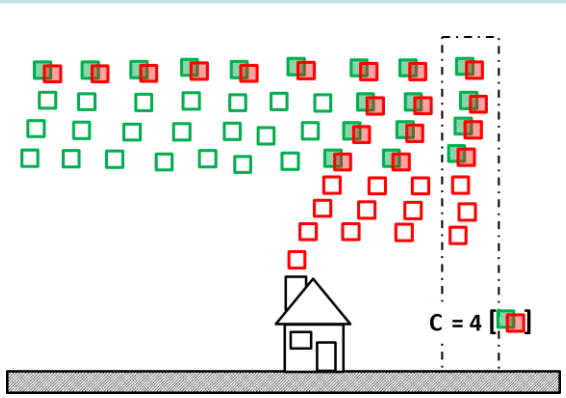
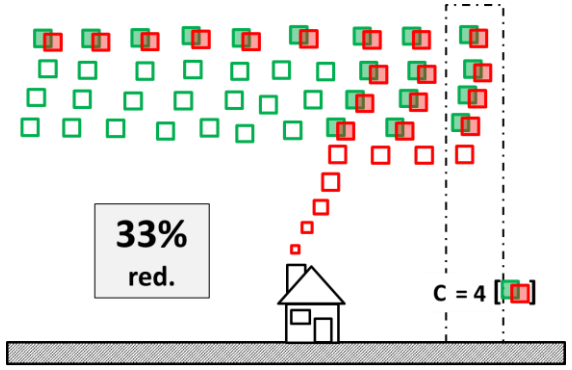
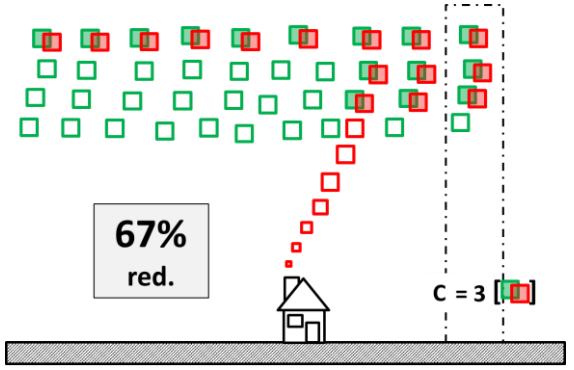
# Tagging vs. impacts

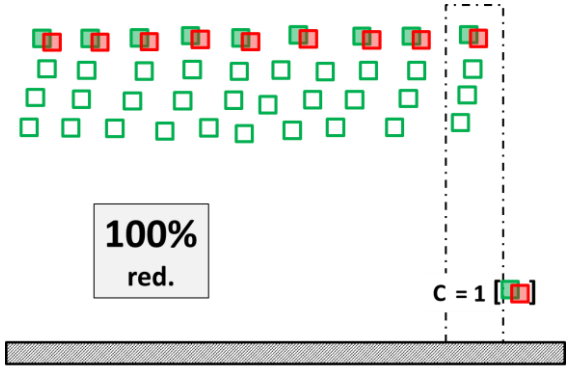



Impact ( ) = $\frac{4\,[\,] - 4\,[\,]}{0.33} = 0\,[\,]$




Impact ( ) = $\frac{4\,[\,] - 3\,[\,]}{0.67} = 1.5\,[\,]$




Impact ( ) = 4 [ ] - 1 [ ] = 3 [ ]

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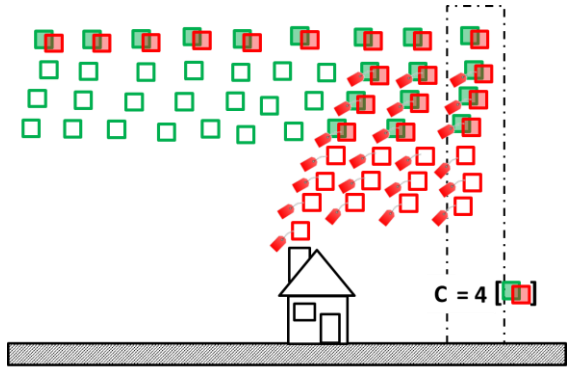
$NH_3$ *Ammonia*

$\Rightarrow PM[NH_4NO_3]$ *Ammonium nitrate*




Contribution ( ) = 3 [ ]