

## Il contributo dei gas a effetto indiretto e il particolato

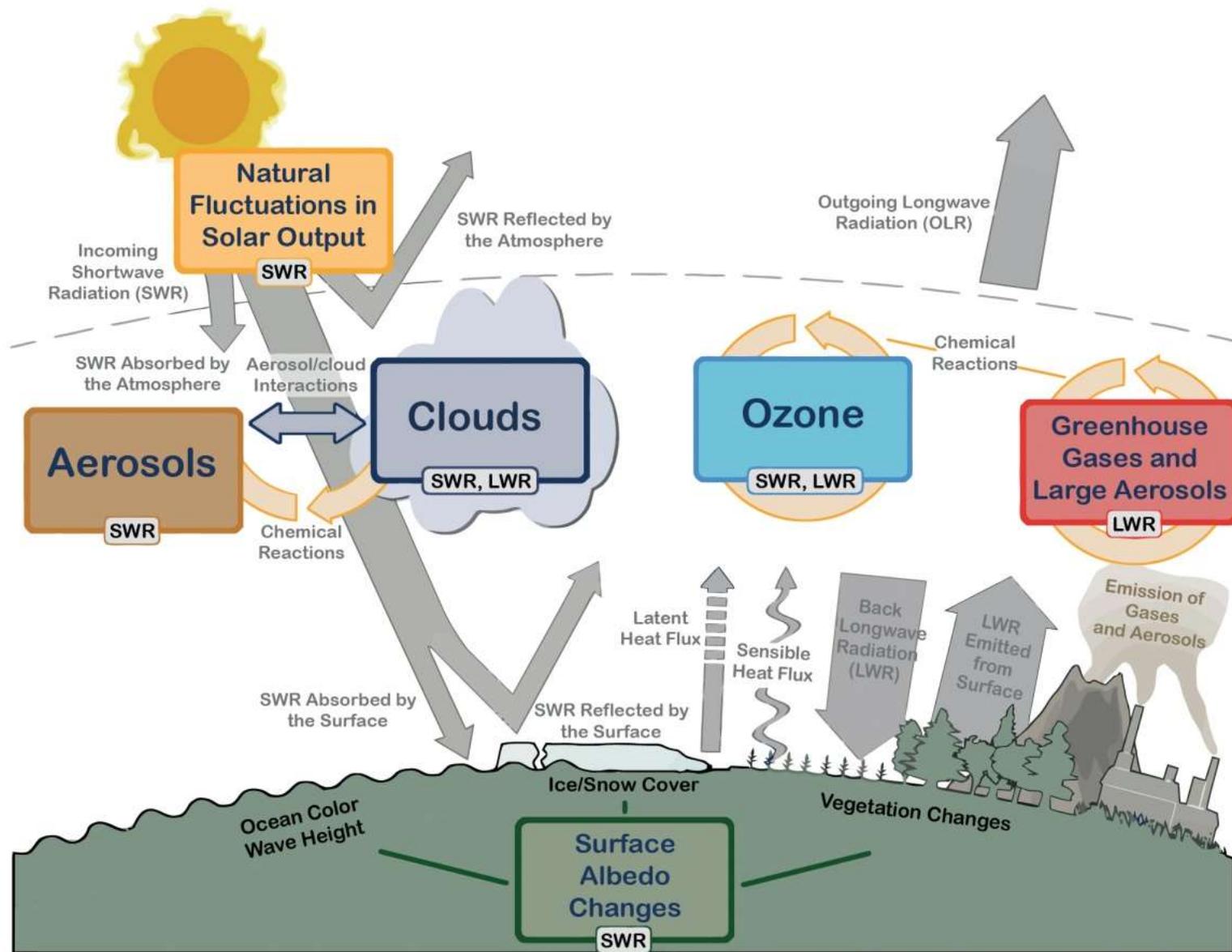
*Ernesto Taurino*

*ISPRA - Istituto Superiore per la Protezione e la Ricerca Ambientale*

# Contenuti

- Dall'effetto serra all'inquinamento atmosferico
- Emissioni indirette di  $N_2O$ : NO<sub>x</sub>
- SO<sub>2</sub>
- Precursori dell'ozono (O<sub>3</sub>): NO<sub>x</sub> e COVNM
- Ancora interazioni tra CC e inquinamento atmosferico
- PM primario e secondario, emissioni e concentrazioni
- Principali fonti per i principali inquinanti (KC 2018)
- Proiezioni

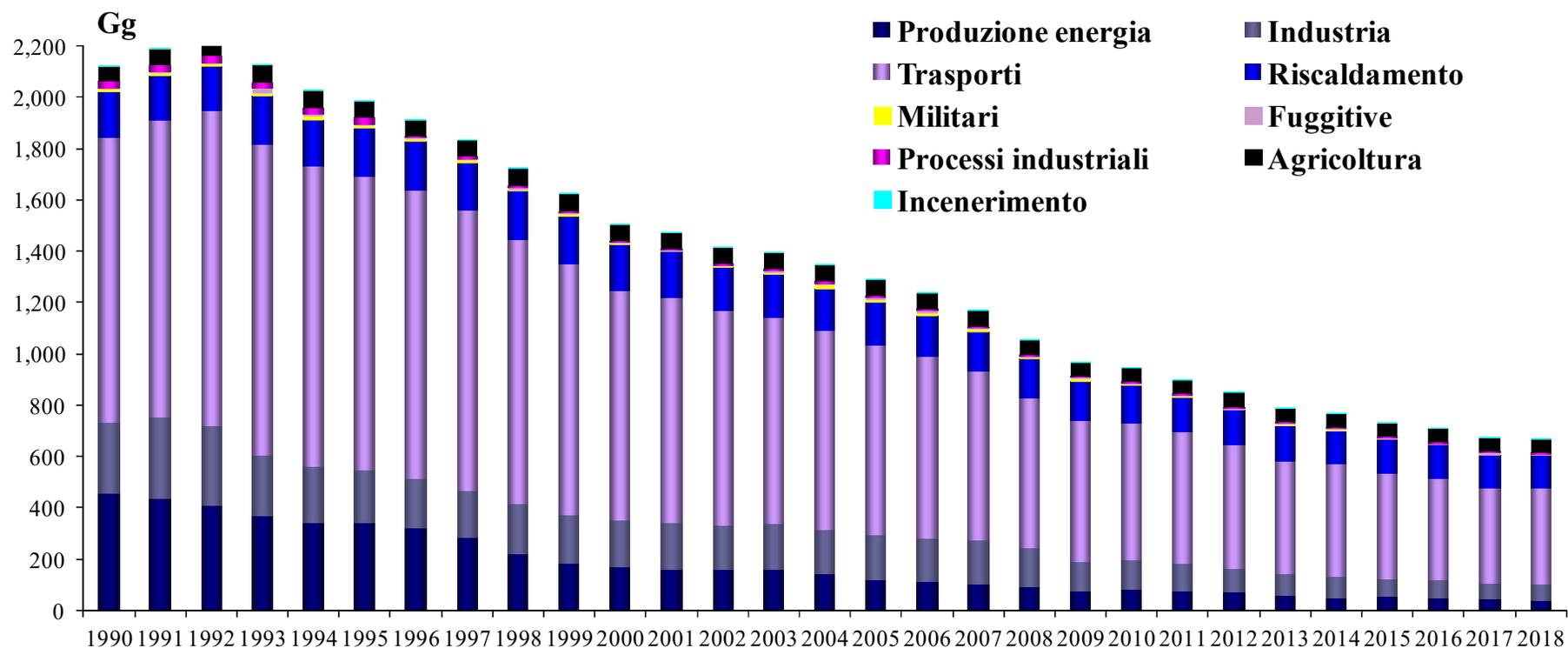
# Dall'effetto serra all'inquinamento atmosferico



Fonte: IPCC,2013. AR5, WG1

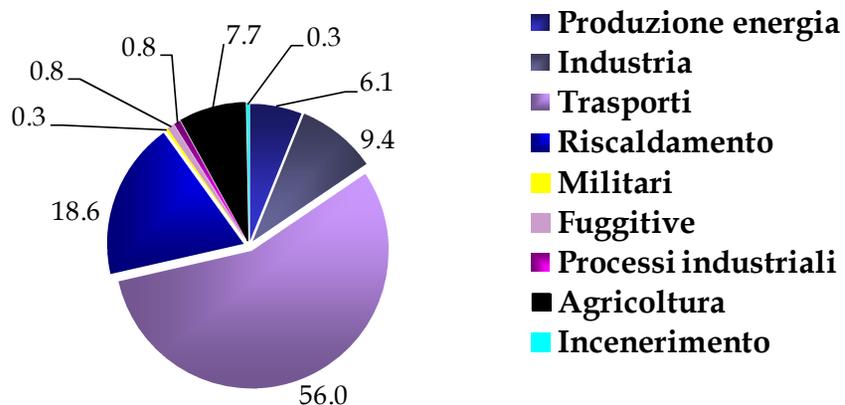
# Emissioni indirette di N<sub>2</sub>O: NO<sub>x</sub> (1/2)

## Emissioni di NO<sub>x</sub>

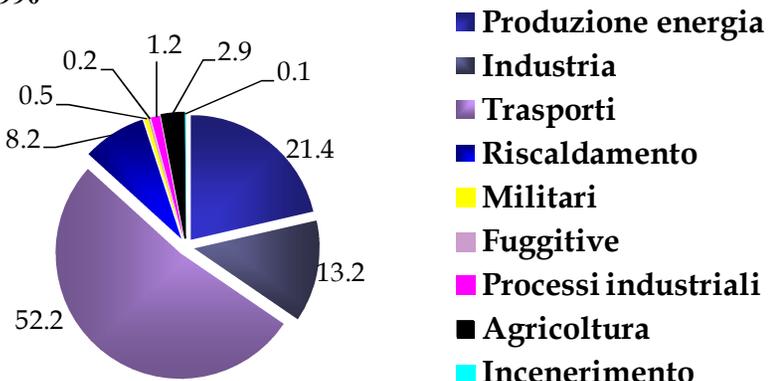


# Emissioni indirette di N<sub>2</sub>O: NO<sub>x</sub> (2/2)

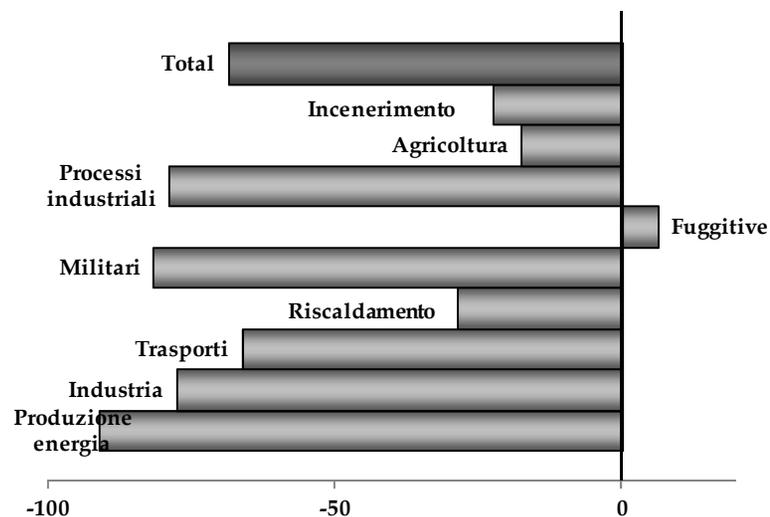
Share 2018



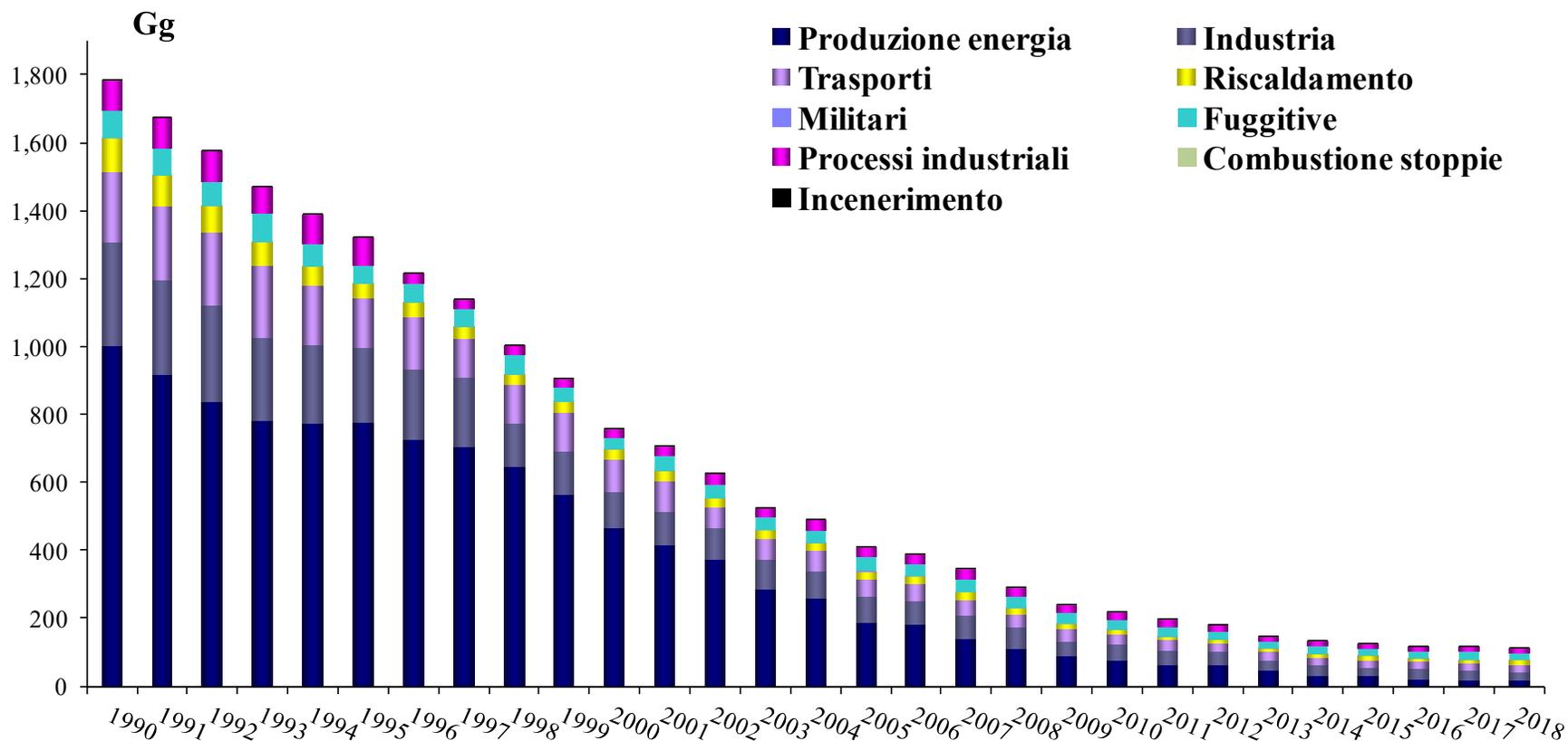
Share 1990



Le figure riportano lo share delle emissioni di NO<sub>x</sub> per settore nel 1990 e nel 2018 nonché la variazione totale e settoriale tra il 1990 e il 2018.

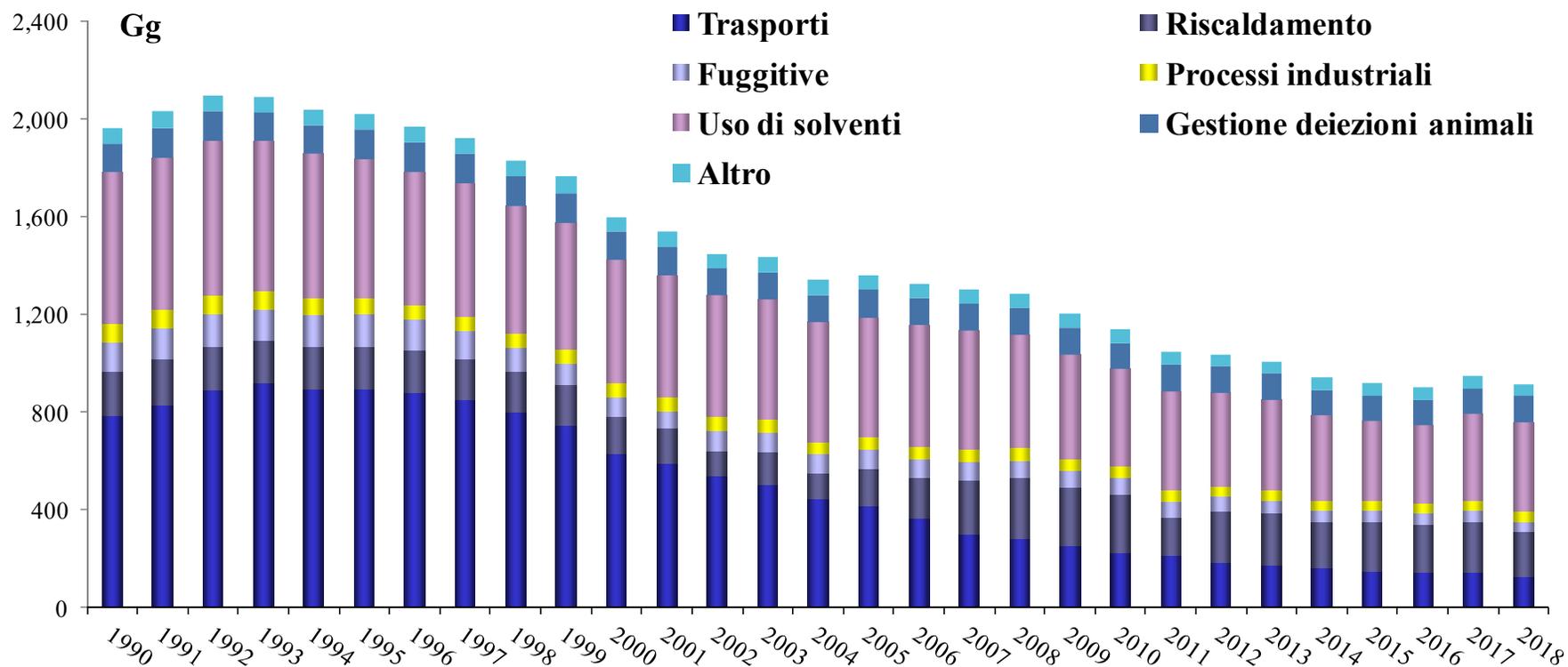


# SO<sub>2</sub>



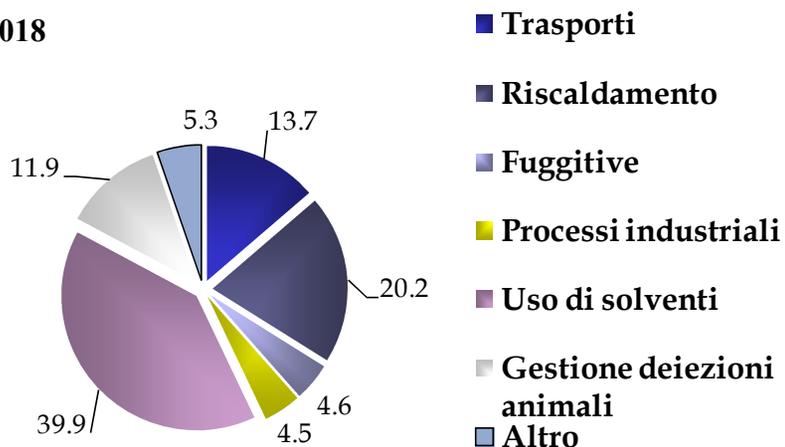
# Precursori dell'ozono (O<sub>3</sub>): NO<sub>x</sub> e COVNM (1/2)

## Emissioni di COVNM



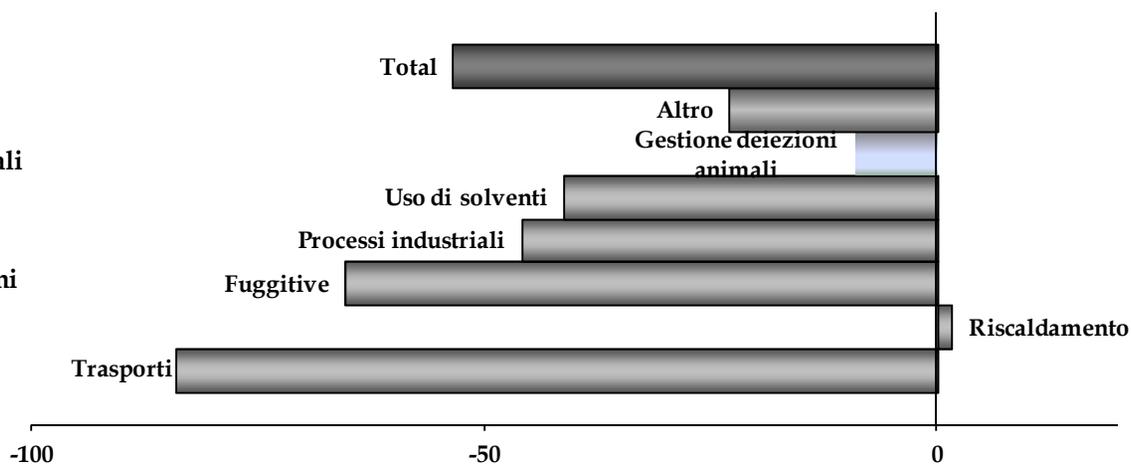
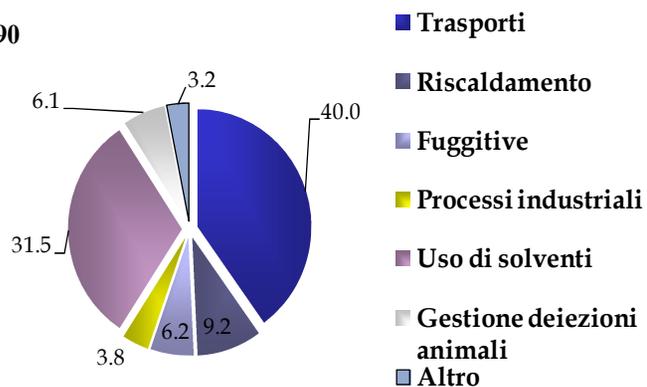
# Precursori dell'ozono (O<sub>3</sub>): NO<sub>x</sub> e COVNM (2/2)

Share 2018

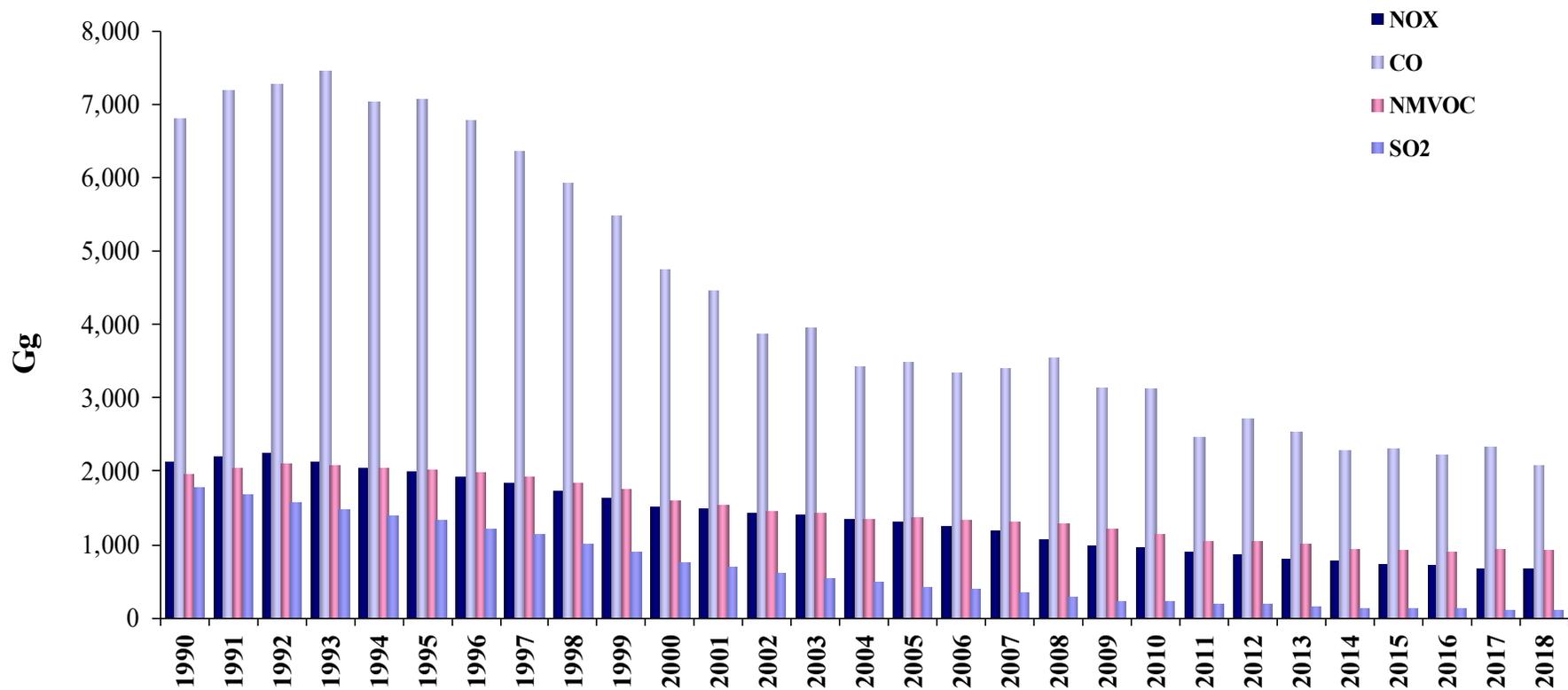


Le figure riportano lo share delle emissioni di **COVNM** per settore nel 1990 e nel 2018 nonché la variazione totale e settoriale tra il 1990 e il 2018.

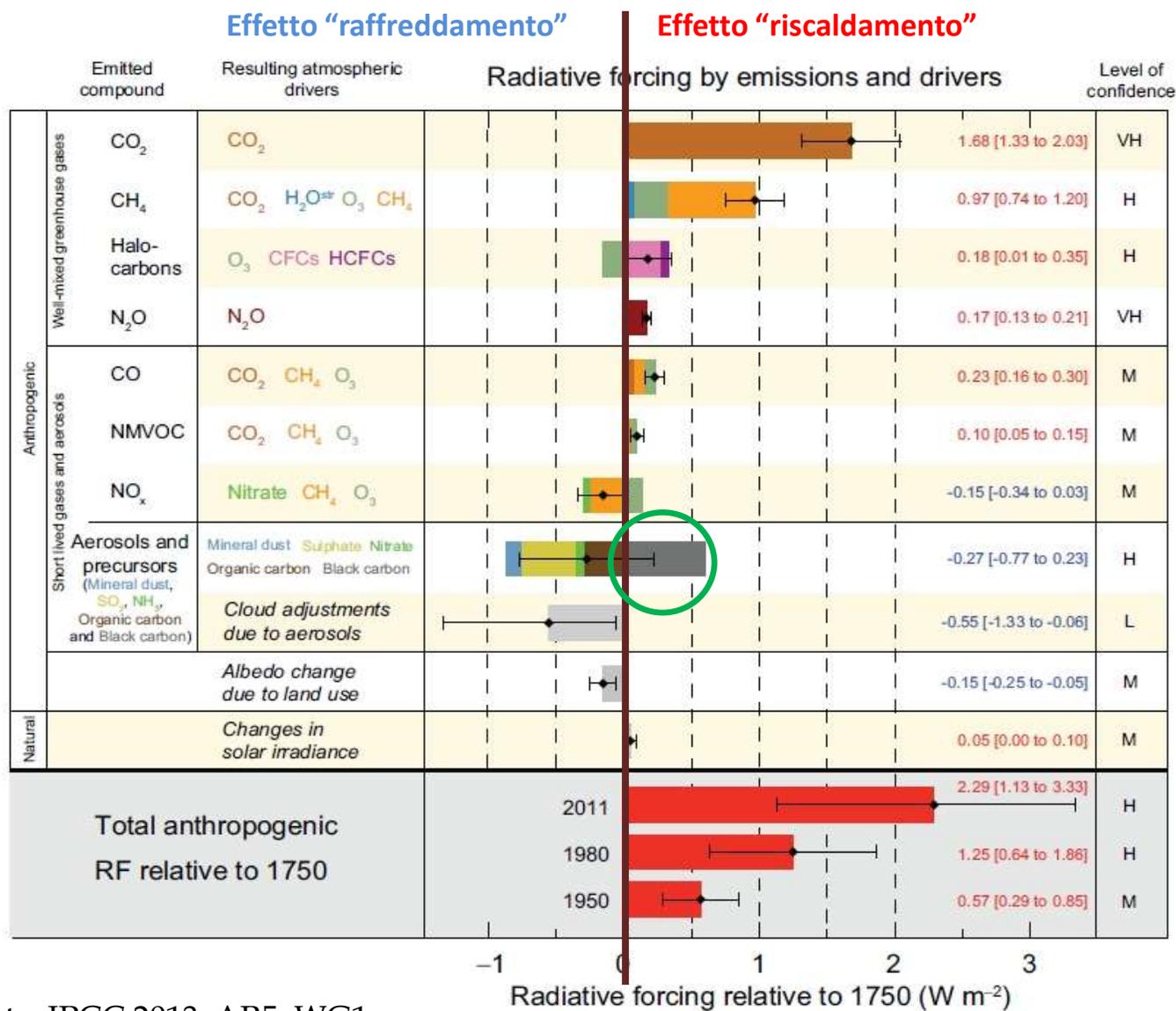
Share 1990



# Riassumendo

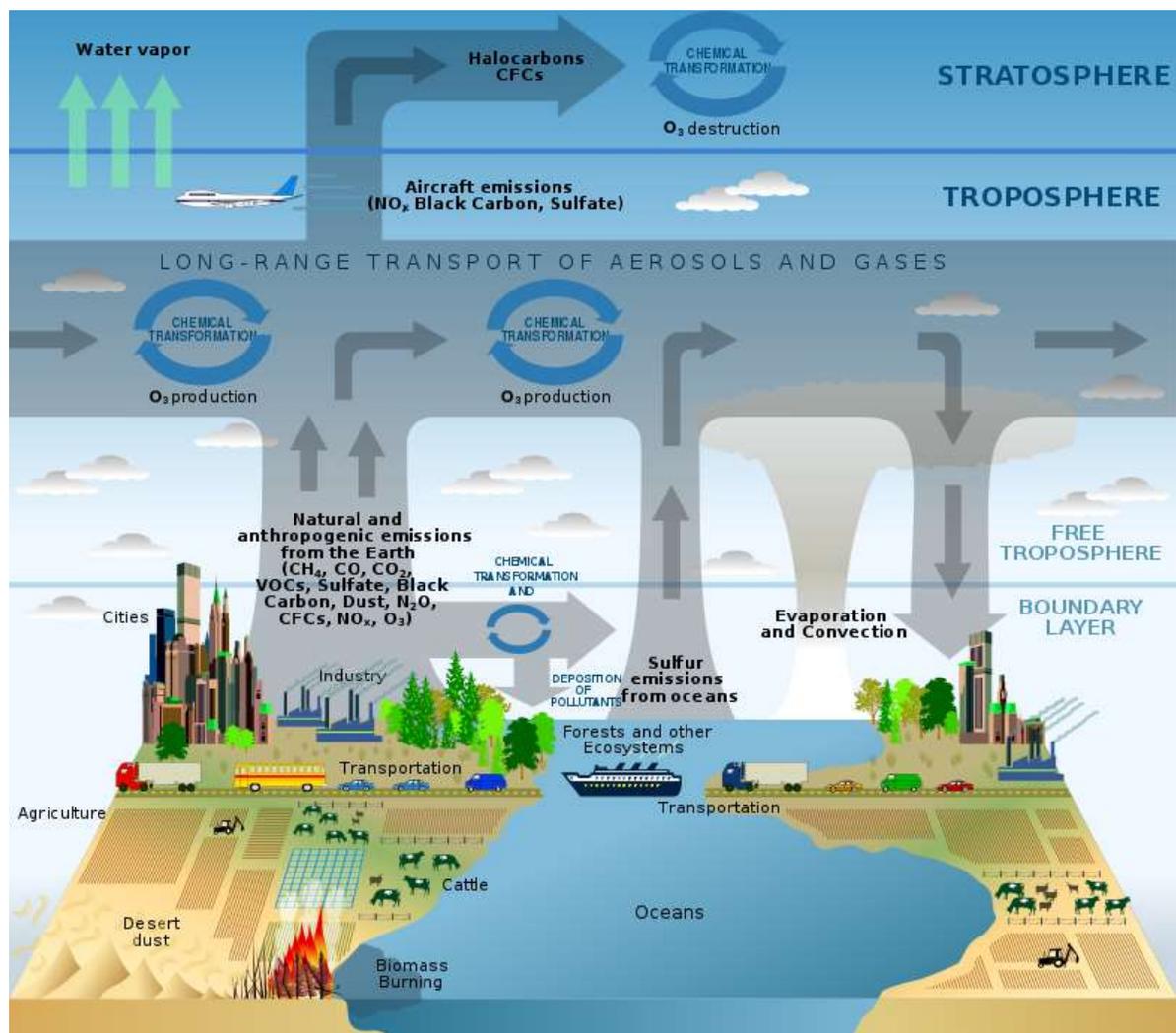


# Interazioni CC e inquinamento atmosferico



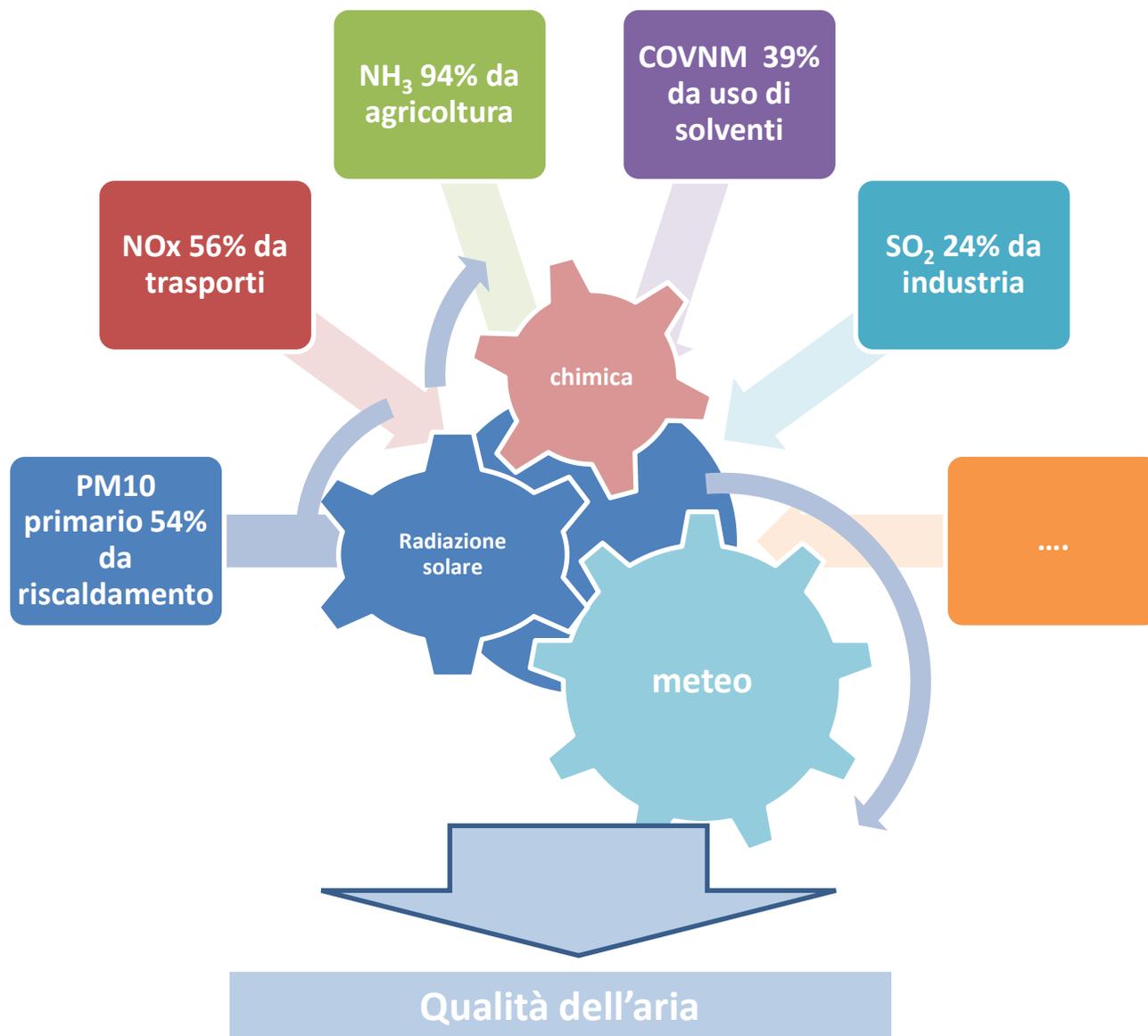
Fonte: IPCC, 2013. AR5, WG1

# PM primario e secondario, emissioni e concentrazioni (1/5)



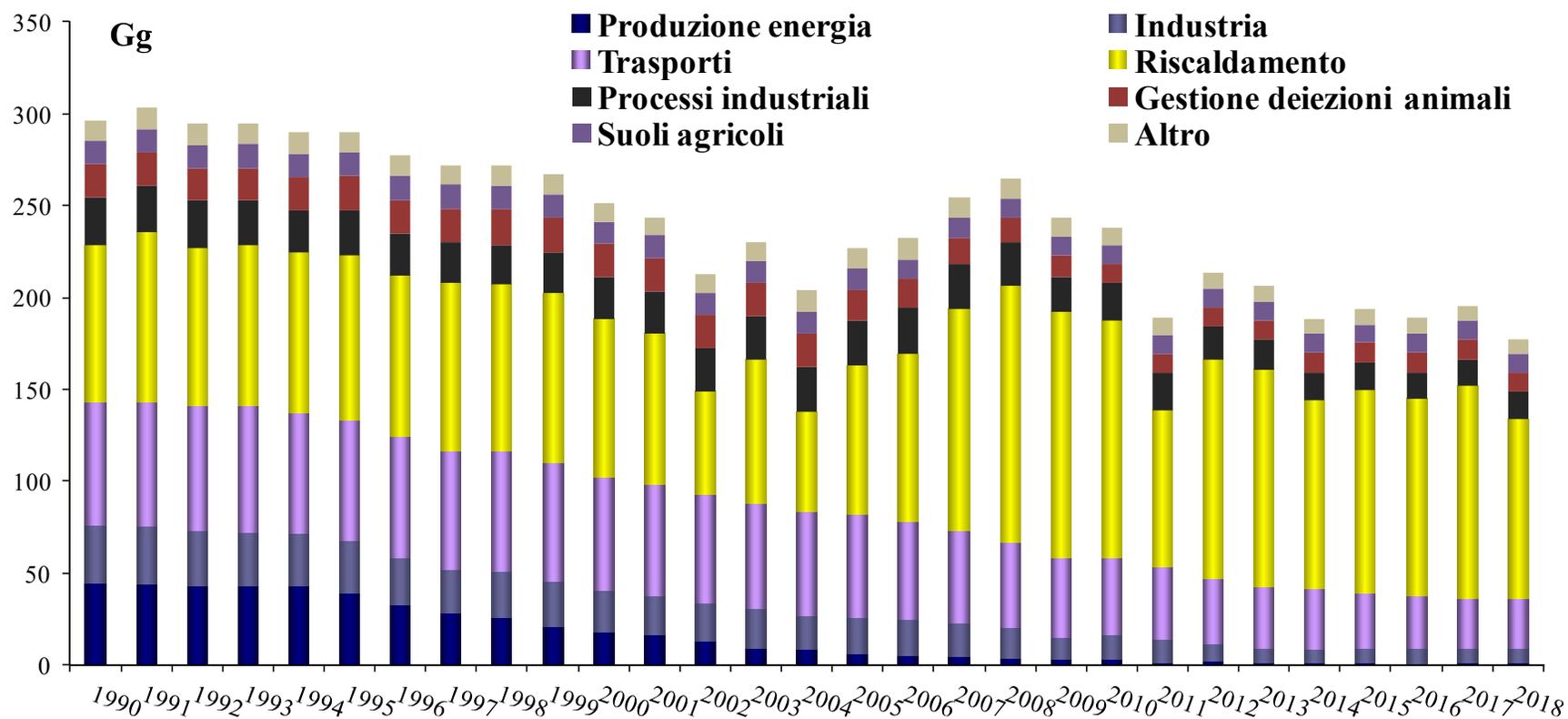
Fonte: U.S. Global Change Science Program, 2003

# PM primario e secondario, emissioni e concentrazioni (2/5)



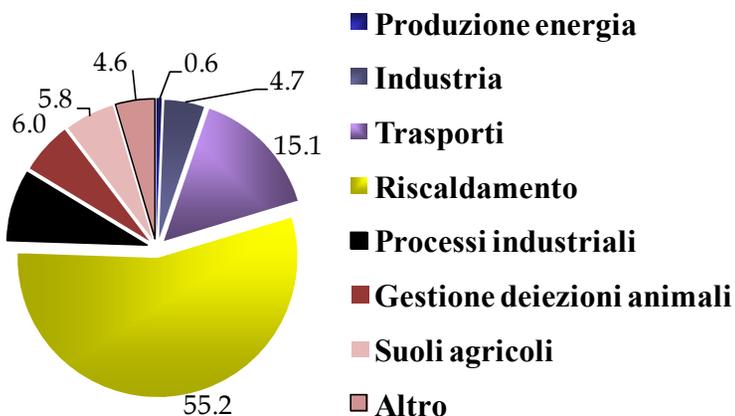
# PM primario e secondario, emissioni e concentrazioni (3/5)

## Emissioni di PM10 primario

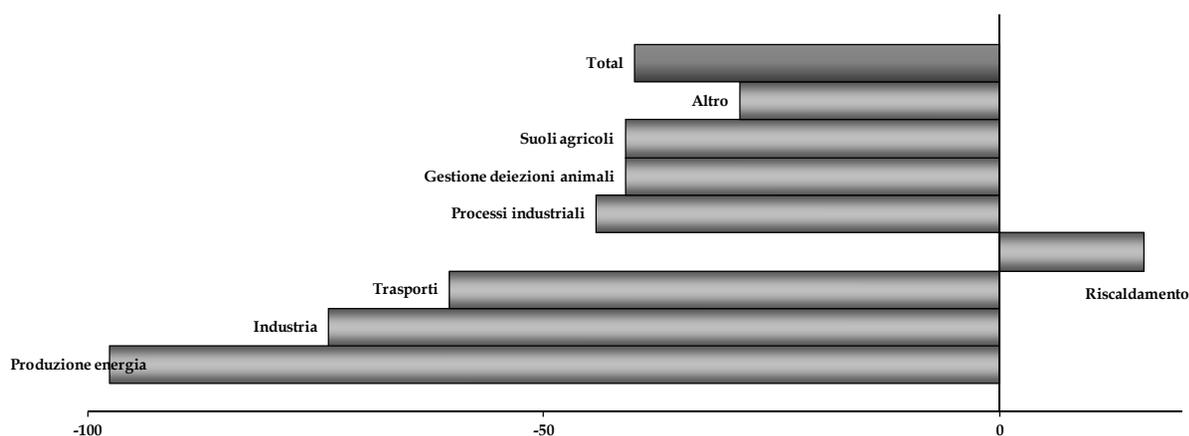
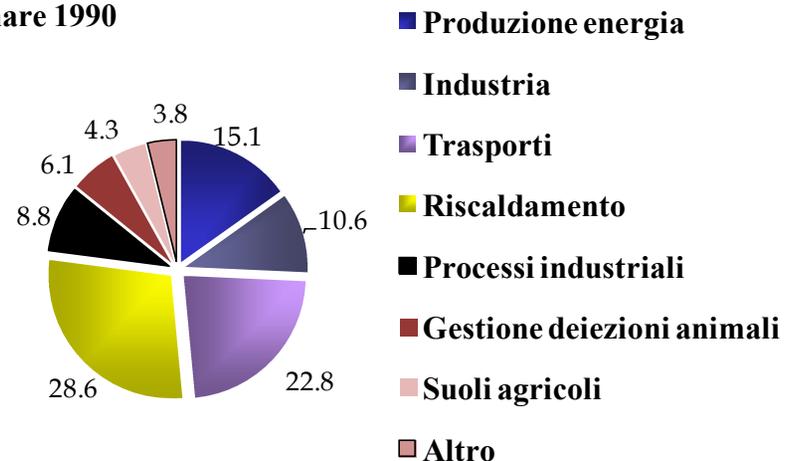


# PM primario e secondario, emissioni e concentrazioni (4/5)

Share 2018

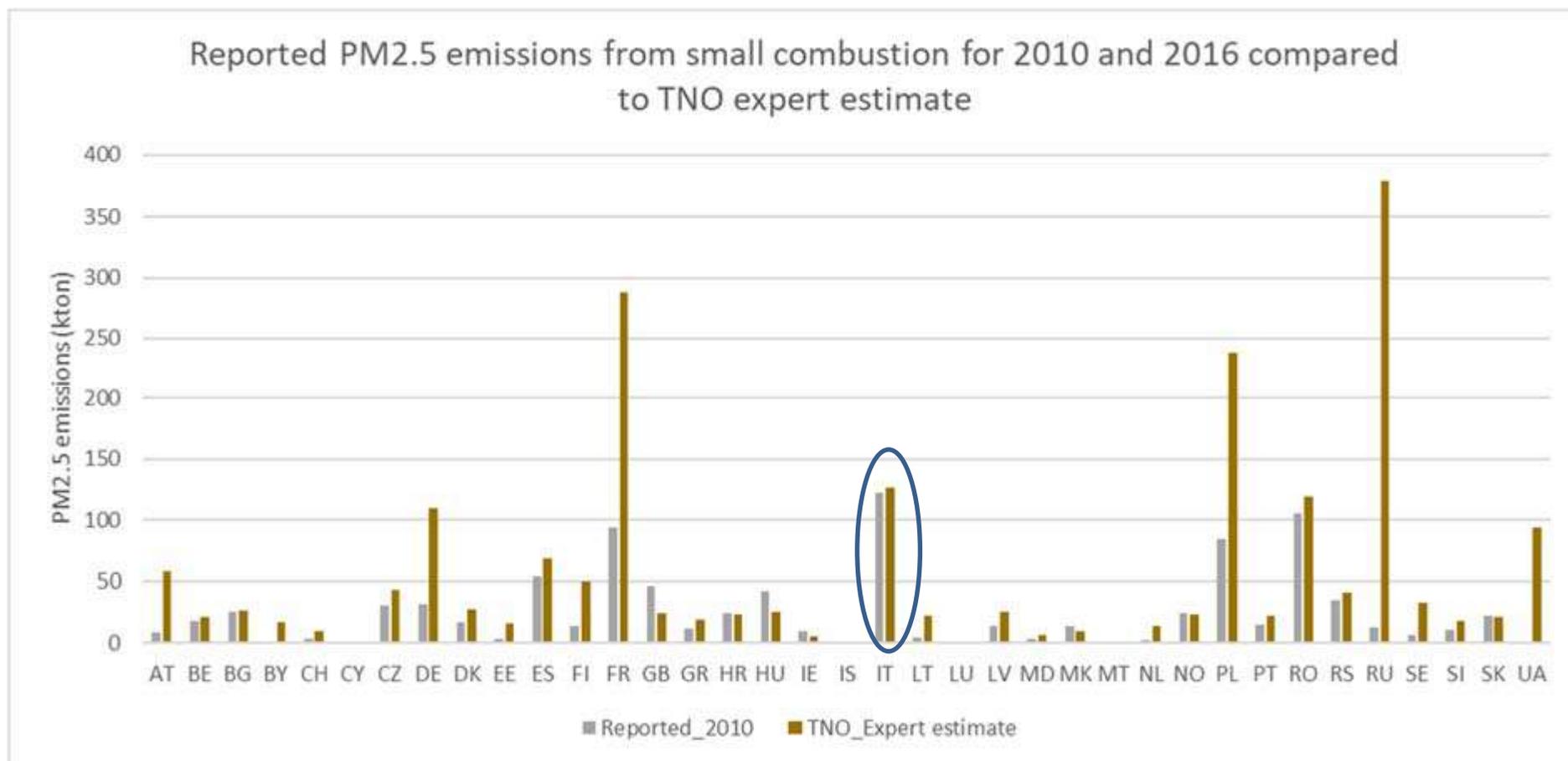


Share 1990



Le figure riportano lo share delle emissioni di **PM10 primario** per settore nel 1990 e nel 2018 nonché la variazione totale e settoriale tra il 1990 e il 2018.

## PM primario e secondario, emissioni e concentrazioni (5/5)



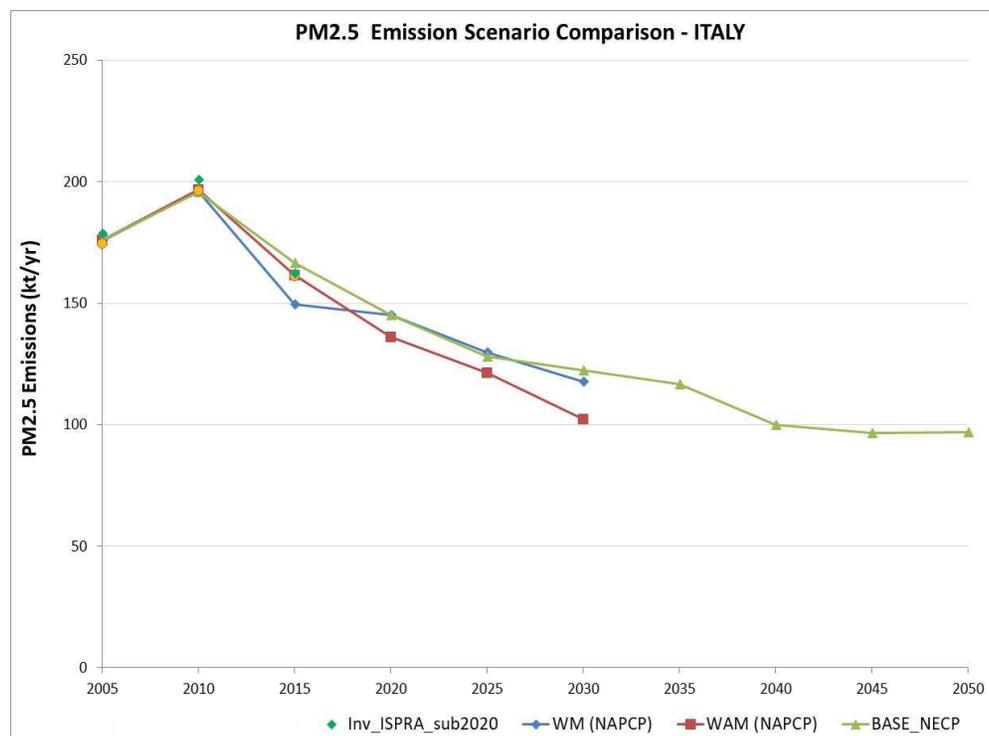
# Principali fonti per principali inquinanti

|                 | Key categories in 2018 |                  |                 |                 |                |                |               |                |               |              |               |            |             | Total (%) |
|-----------------|------------------------|------------------|-----------------|-----------------|----------------|----------------|---------------|----------------|---------------|--------------|---------------|------------|-------------|-----------|
| SO <sub>x</sub> | 1A3d ii (19.7%)        | 1A2f (16.2%)     | 1B2a iv (14.2%) | 1A1a (8.0%)     | 1A1b (5.6%)    | 2B10a (5.5%)   | 1A4b i (5.5%) | 2A1 (5.3%)     | 1A2a (4.3%)   |              |               |            |             | 84.2      |
| NO <sub>x</sub> | 1A3b i (23.2%)         | 1A3b iii (12.8%) | 1A3d ii (11.0%) | 1A3b ii (6.8%)  | 1A4b i (6.1%)  | 1A2f (5.5%)    | 1A4a i (5.1%) | 1A4c ii (4.6%) | 1A1a (4.2%)   | 3Da2a (3.0)  |               |            |             | 82.3      |
| NH <sub>3</sub> | 3Da2a (19.5%)          | 3B1b (18.3%)     | 3B1a (17.3%)    | 3Da1 (13.8%)    | 3B3 (8.5%)     | 3B4g ii (3.6%) |               |                |               |              |               |            |             | 81.0      |
| NMVOC           | 2D3d (16.7%)           | 1A4b i (16.0%)   | 2D3a (9.8%)     | 2D3g (5.9%)     | 1A3b v (5.2%)  | 3B1a (4.7%)    | 3B1b (4.3%)   | 1A3b iv (3.6%) | 1A4a i (3.1%) | 2D3 i (2.9%) | 1A3b i (2.6%) | 2H2 (2.4%) | 1B2b (2.2%) | 81.4      |
|                 | 3Da2a (2.0%)           |                  |                 |                 |                |                |               |                |               |              |               |            |             | 81.4      |
| CO              | 1A4b i (60.1%)         | 1A3b i (12.0%)   | 1A3b iv (5.8%)  | 1A3d ii (2.9%)  |                |                |               |                |               |              |               |            |             | 80.9      |
| PM10            | 1A4b i (52.7%)         | 3Dc (5.8%)       | 1A3b vi (4.9%)  | 1A3d ii (3.2%)  | 2C1 (2.8%)     | 1A2f (2.7%)    | 2A1 (2.5%)    | 1A3bvii (2.5%) | 1A3b i (2.3%) | 2G (1.9%)    |               |            |             | 81.3      |
| PM2.5           | 1A4b i (64.4%)         | 1A3d ii (3.9%)   | 1A3b vi (3.3%)  | 1A2f (2.9%)     | 1A3b i (2.9%)  | 2C1 (2.9%)     |               |                |               |              |               |            |             | 80.3      |
| BC              | 1A4b i (44.5%)         | 1A3b i (17.1%)   | 1A3b ii (6.8%)  | 1A3b iii (6.0%) | 1A4c ii (5.6%) | 1A3d ii (5.2%) |               |                |               |              |               |            |             | 85.1      |
| Pb              | 2C1 (34.0%)            | 1A2f (29.7%)     | 1A2a (10.9%)    | 2G (5.5%)       |                |                |               |                |               |              |               |            |             | 80.1      |
| Cd              | 1A2a (24.1%)           | 2C1 (20.9%)      | 1A2f (10.1%)    | 5C2 (9.5%)      | 1A4b i (7.5%)  | 2G (7.3%)      | 1A3b i (5.0%) |                |               |              |               |            |             | 84.5      |
| Hg              | 2C1 (43.0%)            | 1B2d (10.2%)     | 1A2a (9.4%)     | 1A2f (8.3%)     | 1A2b (7.4%)    | 1A1a (6.8%)    |               |                |               |              |               |            |             | 85.2      |
| PAH             | 1A4b i (76.9%)         | 2C1 (13.9%)      |                 |                 |                |                |               |                |               |              |               |            |             | 90.8      |
| Dioxin          | 1A4b i (36.2%)         | 2C1 (32.1%)      | 1A2b (18.5%)    |                 |                |                |               |                |               |              |               |            |             | 86.8      |
| HCB             | 3Df (29.2%)            | 1A4a i (18.4%)   | 1A2a (16.9%)    | 1A4b i (15.2%)  | 1A1a (7.3%)    |                |               |                |               |              |               |            |             | 87.0      |
| PCB             | 2C1 (76.0%)            | 1A4b i (13.3%)   |                 |                 |                |                |               |                |               |              |               |            |             | 89.4      |

1 Energy  
 2 IPPU - Industry  
 2 IPPU - Solvent and product use  
 3 Agriculture  
 5 Waste

# Proiezioni

|                 | 2030 emission reductions from 2005 |               |         |          |                |
|-----------------|------------------------------------|---------------|---------|----------|----------------|
|                 | NECD Target                        | Stato attuale | 2030_WM | 2030_WAM | 2030_BASE_NECP |
| SO <sub>2</sub> | -71%                               | -73%          | -73%    | -80%     | -78%           |
| NO <sub>x</sub> | -65%                               | -48%          | -63%    | -70%     | -65%           |
| PM2.5           | -40%                               | -19%          | -33%    | -42%     | -30%           |
| NMVOC           | -46%                               | -33%          | -43%    | -50%     | -48%           |
| NH <sub>3</sub> | -16%                               | -14%          | -11%    | -17%     | -13%           |



**Grazie per l'attenzione, aspettiamo le vostre  
domande in chat**



“Una cosa ho imparato nella mia lunga vita: che tutta la nostra scienza, commisurata alla realtà, è primitiva e infantile, eppure è la cosa più preziosa che abbiamo”

A. Einstein