

# 能源政策對台灣空氣品質 之影響

吳義林

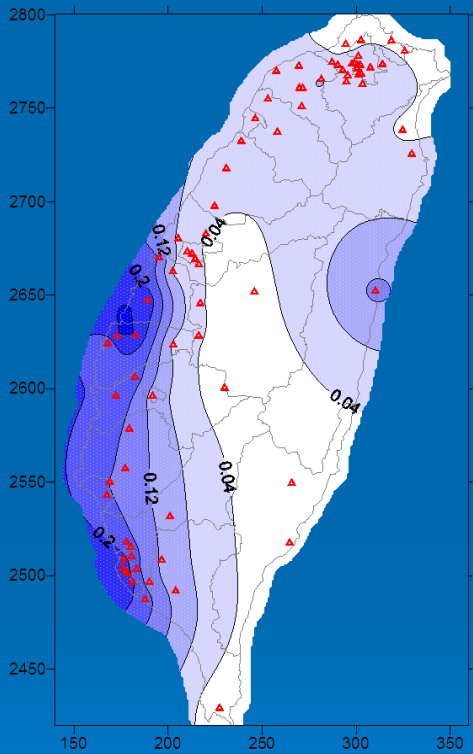
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北部永續環境研討會，環境保護聯盟  
桃園，2021年11月25日

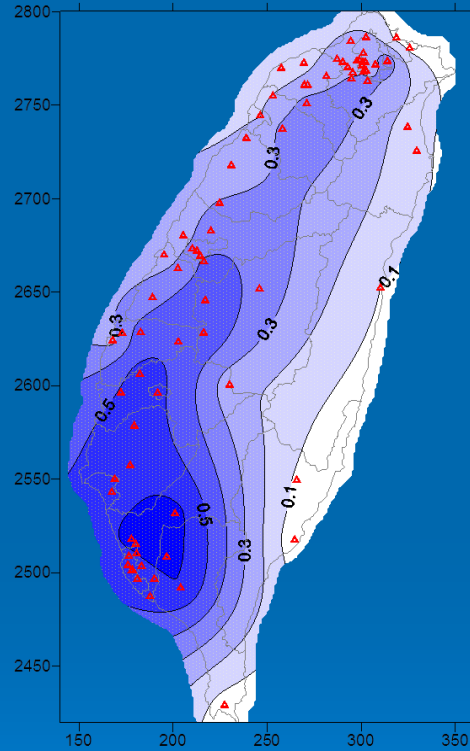
# 各行業 之排放 量與對 PM<sub>2.5</sub>濃 度之貢 獻

|         | 排放量 (噸) |                 |                 | PM 2.5濃度貢獻比率 (%) |                 |                 |       | 每萬噸之PM 2.5濃度貢獻比率 (%) |                 |                 |
|---------|---------|-----------------|-----------------|------------------|-----------------|-----------------|-------|----------------------|-----------------|-----------------|
|         | PM 2.5  | NO <sub>x</sub> | SO <sub>x</sub> | PM 2.5           | NO <sub>x</sub> | SO <sub>x</sub> | 合計    | PM 2.5               | NO <sub>x</sub> | SO <sub>x</sub> |
| 大貨車     | 6595.08 | 113454.4        | 70.23           | 3.73%            | 5.79%           | 0.00%           | 9.53% | 5.66%                | 0.51%           | 0.71%           |
| 餐飲業油煙排放 | 6114    |                 |                 | 6.13%            |                 |                 | 6.13% | 10.03%               |                 |                 |
| 電力業     | 2973    | 73114           | 45240           | 0.57%            | 2.79%           | 2.23%           | 5.60% | 1.93%                | 0.38%           | 0.49%           |
| 鋪面道路揚塵  | 8453    |                 |                 | 4.97%            | -               | -               | 4.97% | 5.88%                |                 |                 |
| 自用小客車   | 3571    | 38500           | 140.62          | 2.42%            | 1.74%           | 0.01%           | 4.17% | 6.78%                | 0.45%           | 0.80%           |
| 鋼鐵基本業   | 3328    | 13772           | 15423           | 1.61%            | 0.22%           | 0.46%           | 2.29% | 4.83%                | 0.16%           | 0.30%           |
| 農業燃燒_水田 | 2636    | 2390            | 494             | 1.73%            | 0.09%           | 0.03%           | 1.84% | 6.55%                | 0.36%           | 0.67%           |
| 四行程機車   | 1560    | 13984           | 47.88           | 1.10%            | 0.54%           | 0.00%           | 1.65% | 7.06%                | 0.39%           | 0.75%           |
| 其他大客車   | 1056    | 21027           | 15.97           | 0.71%            | 0.90%           | 0.00%           | 1.61% | 6.69%                | 0.43%           | 0.64%           |
| 裸露地表    | 3533    |                 |                 | 1.59%            | -               | -               | 1.59% | 4.50%                |                 |                 |
| 煉油業     | 855     | 16385           | 13130           | 0.47%            | 0.48%           | 0.59%           | 1.55% | 5.47%                | 0.29%           | 0.45%           |
| 建築施工    | 3974    |                 |                 | 1.41%            | -               | -               | 1.41% | 3.55%                |                 |                 |
| 化學材料製造業 | 1037    | 15622           | 7743            | 0.49%            | 0.57%           | 0.34%           | 1.41% | 4.72%                | 0.37%           | 0.44%           |
| 混凝土     | 1707    | 19321           | 781             | 1.02%            | 0.35%           | 0.03%           | 1.40% | 5.99%                | 0.18%           | 0.35%           |
| 成衣業     | 783     | 5149            | 4755            | 0.56%            | 0.27%           | 0.41%           | 1.24% | 7.15%                | 0.53%           | 0.86%           |
| 二行程機車   | 1696    | 3638            | 11.86           | 1.02%            | 0.13%           | 0.00%           | 1.15% | 6.00%                | 0.37%           | 0.62%           |
| 公車客運車   | 525     | 11945           | 9.1             | 0.49%            | 0.46%           | 0.00%           | 0.95% | 9.31%                | 0.39%           | 1.04%           |
| 金屬製品製造業 | 1114    | 6060            | 1332            | 0.75%            | 0.09%           | 0.08%           | 0.93% | 6.77%                | 0.15%           | 0.61%           |
| 船舶      | 143     | 16427           | 8057            | 0.06%            | 0.48%           | 0.37%           | 0.91% | 4.49%                | 0.29%           | 0.46%           |
| 柴油小貨車   | 1023    | 5532            | 14.75           | 0.58%            | 0.25%           | 0.00%           | 0.83% | 5.68%                | 0.45%           | 0.62%           |
| 農業操作    | 3693    |                 |                 | 0.74%            | -               | -               | 0.74% | 2.02%                |                 |                 |
| 食品業     | 835     | 2256            | 2227            | 0.40%            | 0.10%           | 0.14%           | 0.64% | 4.83%                | 0.43%           | 0.64%           |
| 造紙印刷    | 435     | 4394            | 3472            | 0.19%            | 0.21%           | 0.21%           | 0.61% | 4.43%                | 0.48%           | 0.60%           |
| 塑膠製品製造業 | 466     | 3600            | 2416            | 0.29%            | 0.12%           | 0.15%           | 0.57% | 6.26%                | 0.34%           | 0.63%           |
| 商業燃燒排放  | 134     | 3468            | 3437            | 0.12%            | 0.13%           | 0.32%           | 0.57% | 9.07%                | 0.36%           | 0.93%           |
| 礦場      | 3534    |                 |                 | 0.53%            | -               | -               | 0.53% | 1.51%                |                 |                 |
| 汽油小貨車   | 377     | 5309            | 21.04           | 0.24%            | 0.24%           | 0.00%           | 0.48% | 6.30%                | 0.45%           | 0.71%           |
| 住宅燃燒    | 230     | 4118            | 700             | 0.18%            | 0.14%           | 0.06%           | 0.38% | 7.93%                | 0.33%           | 0.89%           |
| 玻璃業     | 150     | 2763            | 825             | 0.11%            | 0.14%           | 0.06%           | 0.31% | 7.14%                | 0.52%           | 0.67%           |
| 農業燃燒_果園 | 1949    | 4169            | 74              | 0.13%            | 0.06%           | 0.00%           | 0.18% | 0.65%                | 0.14%           | 0.06%           |
| 電子器材製造業 | 118     | 333             | 90              | 0.09%            | 0.02%           | 0.01%           | 0.11% | 7.34%                | 0.52%           | 0.89%           |

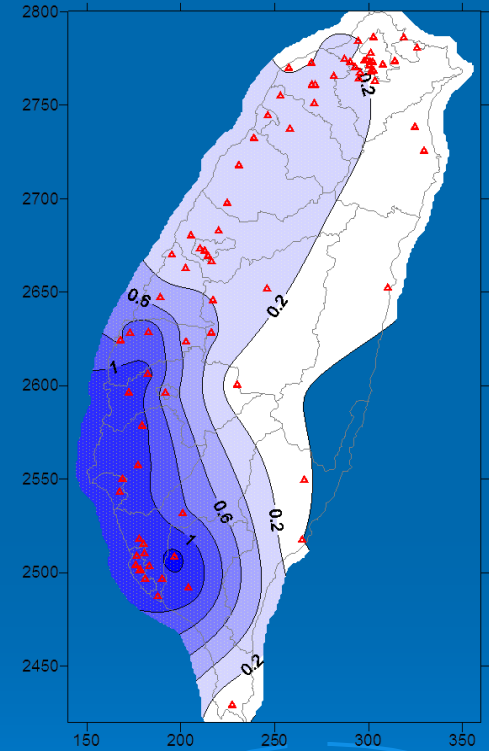
# 電力業排放之影響空間分布圖



PM2.5

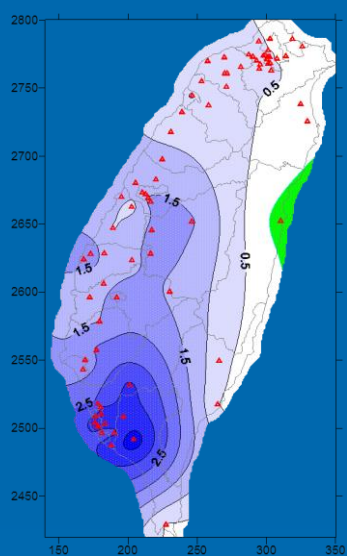


SOx

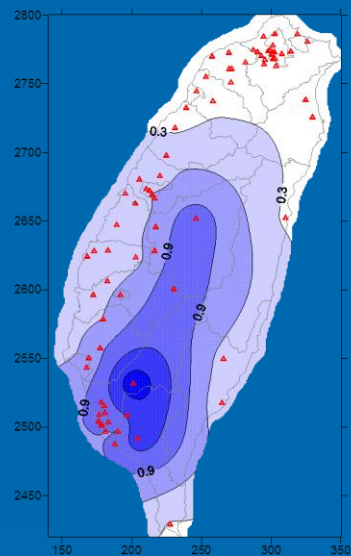


NOx

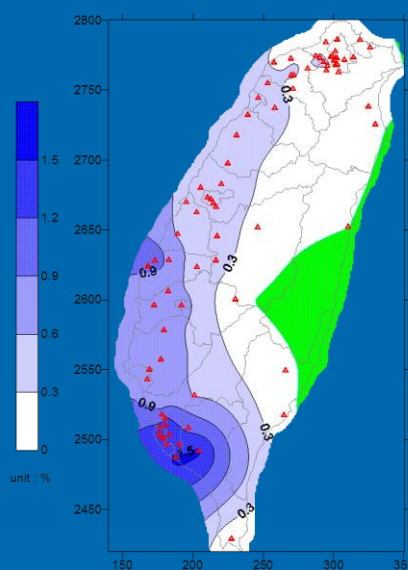
# 以天然氣取代燃煤對台灣地區細懸浮微粒及其成分濃度之平均削減比例的空間分布



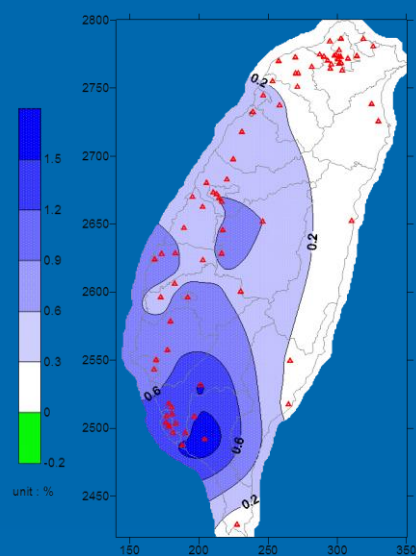
PM<sub>2.5</sub>



SO<sub>4</sub><sup>-2</sup>

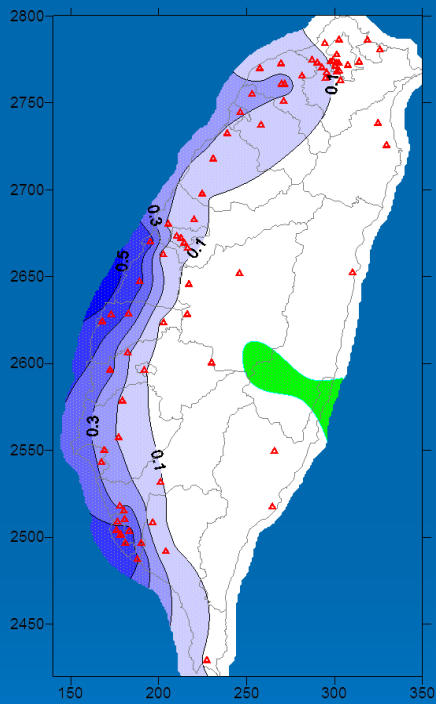


NO<sub>3</sub><sup>-</sup>

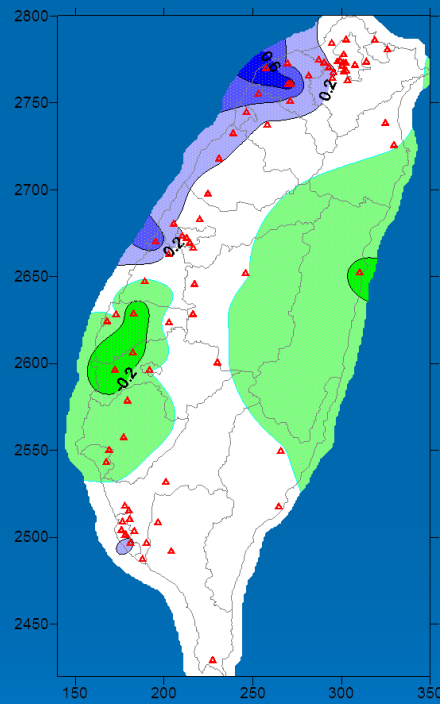


NH<sub>4</sub><sup>+</sup>

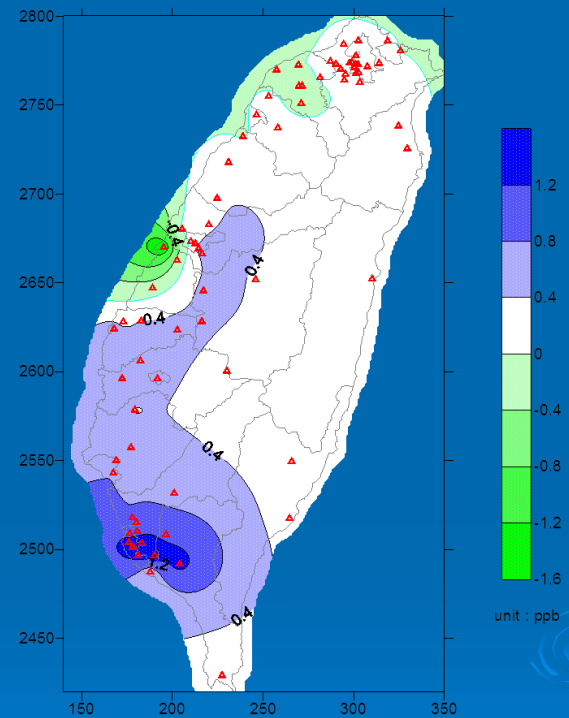
# 以天然氣取代燃煤對台灣地區之SO<sub>2</sub>、NO<sub>x</sub>與O<sub>3</sub>濃度削減平均值的空間分布



SO<sub>2</sub>

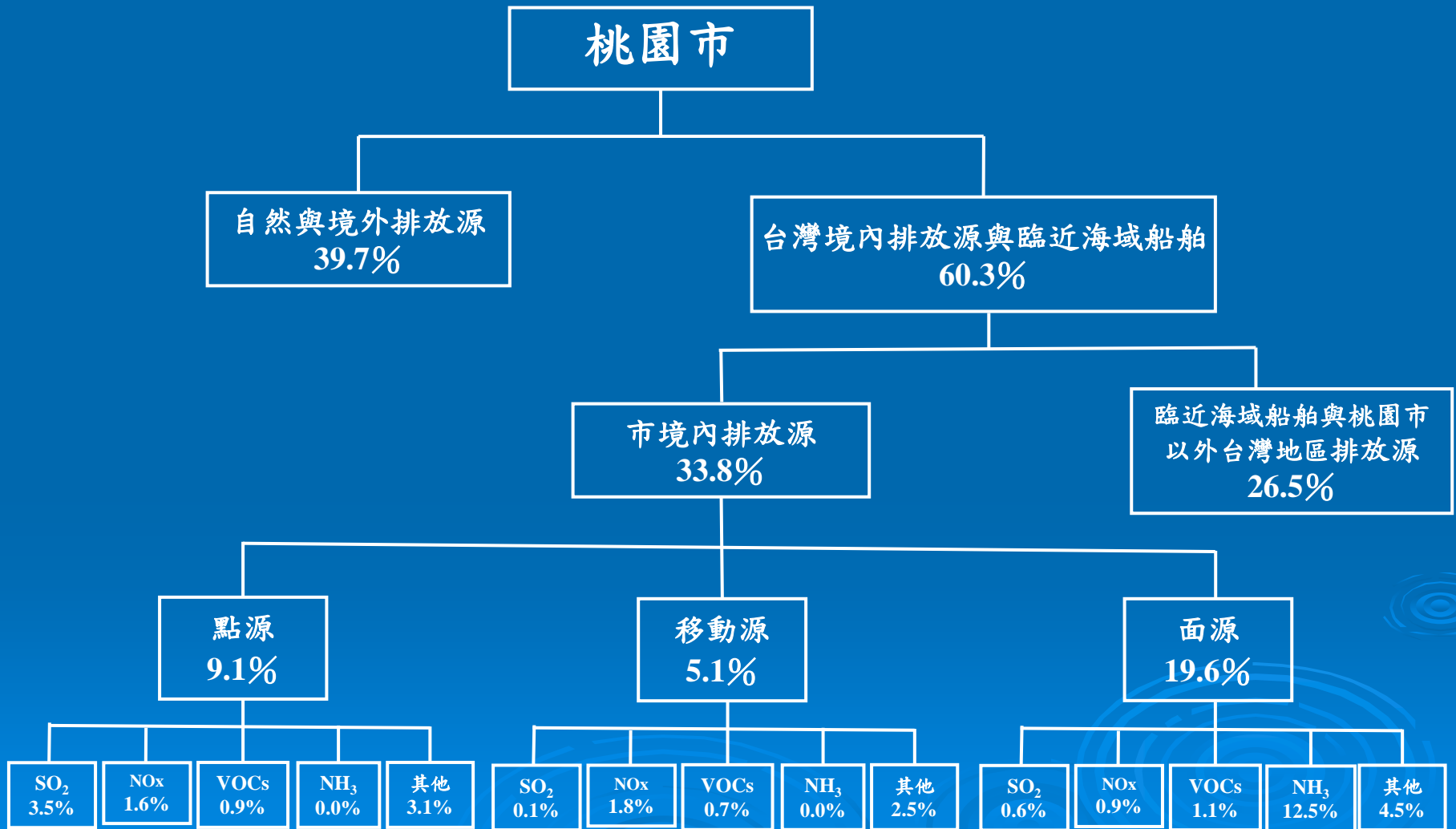


NO<sub>x</sub>

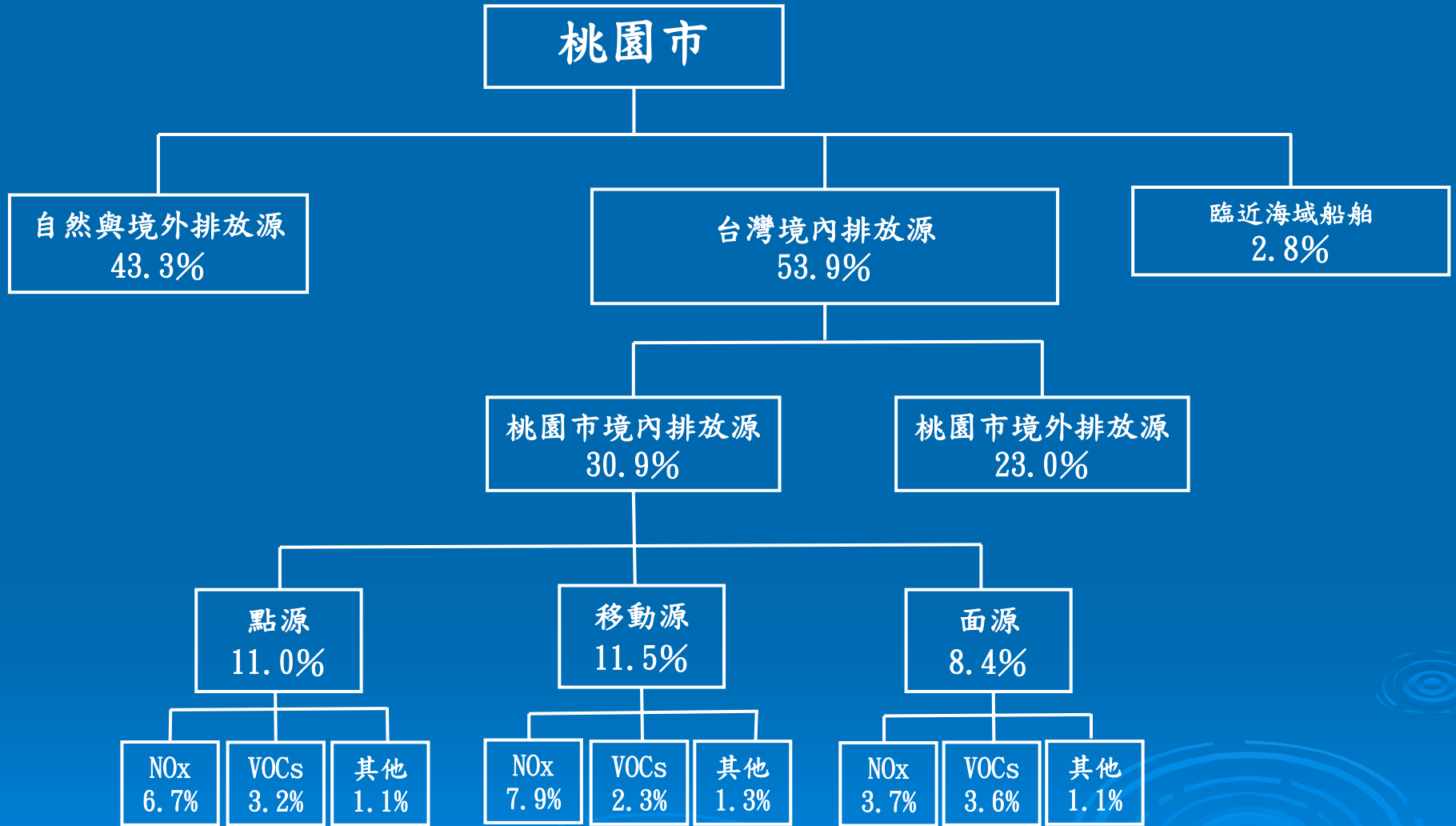


O<sub>3</sub>

# 桃園市細懸浮微粒事件日來源之年平均



# 桃園市臭氧八小時事件日來源之年平均



相同NOx與VOCs排放量時，NOx之臭氧生成量約為VOCs之2倍以上，尤其是面源之比例達約14倍

# 結論

1. 以天然氣取代燃煤對台灣地區細懸浮微粒濃度平均可降低約1%，主要在下風處之高屏空品區；
2. 以天然氣取代燃煤時中部以北地區之臭氧濃度反而上升；



*Thanks for Your  
Attentions*