Combining offshore wind energy and large-scale mussel farming

Ambition & conceptual design

• **Wind energy**: 5 clusters with 40 x 5MW-turbines each ➔ 5x 200 MW = 1,000 MW

• **Mussel farming**: 4 clusters with 1,800 mussel long line systems each ➔ 50,000 (36,000-75,000) tons production per year

Mussel farm cluster outline

- longlines held by poles or anchors

Overall conclusions from the Blauwdruk project

• 10% synergy seems feasible by combining Operation & Maintainance (O&M) activities; model simulations show an increased Return on Investment (ROI)

• Mussel & seed mussel culture considered most promising for offshore aquaculture in Dutch North Sea

• Wind farm foundation type: monopile or gravity based (lower risk of high drag force incident)

• Mussel farm: type and size determine extent of effects on water/ sediment quality (e.g. corrosion resistance of materials used) ➔ risk assessment needed

• Individual marine ecosystem components may be affected differently by different pressures: no generalisation possible concerning ecosystem impacts

- Stepwise learning-by-doing: from small-scale pilot projects to large-scale
- Development from pilots to full-scale commercial cultures will likely take ca. 8-10 years
- Other aquaculture options (fisheries, seaweed, lobsters, oysters) might also be considered during this development period, to optimize spatial use within (or in the vicinity of) wind farms

Risks and opportunities

• **Operational wind farm**: e.g. collision (birds, bats); potential barrier effect (sea mammals); Benefits: new habitat, potential refuge (fish)

• **Aquaculture system**: e.g. barrier effect (sea mammals), attraction of invasive species; Benefits: increased phytoplankton production, potential refuge (fish)

• **Combination**: e.g. enhanced risk of biofouling/ corrosion due to effects on seawater chemistry; Benefits: increased food availability/ new habitat/ shelter ➔ enhanced biological production