

REDUCING EMISSION IN WINE INDUSTRY IN PORTUGAL

Portugal is the fifth largest wine producer in Europe, producing 6.4 million hectoliters of wine each year. The European market is an oligopoly with the top three wine-producing countries (Spain, Italy, and France) that produce about 136.4 million hectoliters of wine each year as part of 159 million hectoliters of wine in the entire European market in 2020. However, it is important to highlight that wine production pollutes the atmosphere much less than the production of meat, cheese, and milk. But still liter of wine produced emits 1.79 kg of CO₂.

To represent the current problem has been created a model, which consists of 5 stages of production and investment (Fig. 1-4). The purpose of the model is to show how level of the emissions could be decreased on different stages of the production process via different approaches. This allows to make the industry environmentally friendly in accordance with the goals of sustainable development.

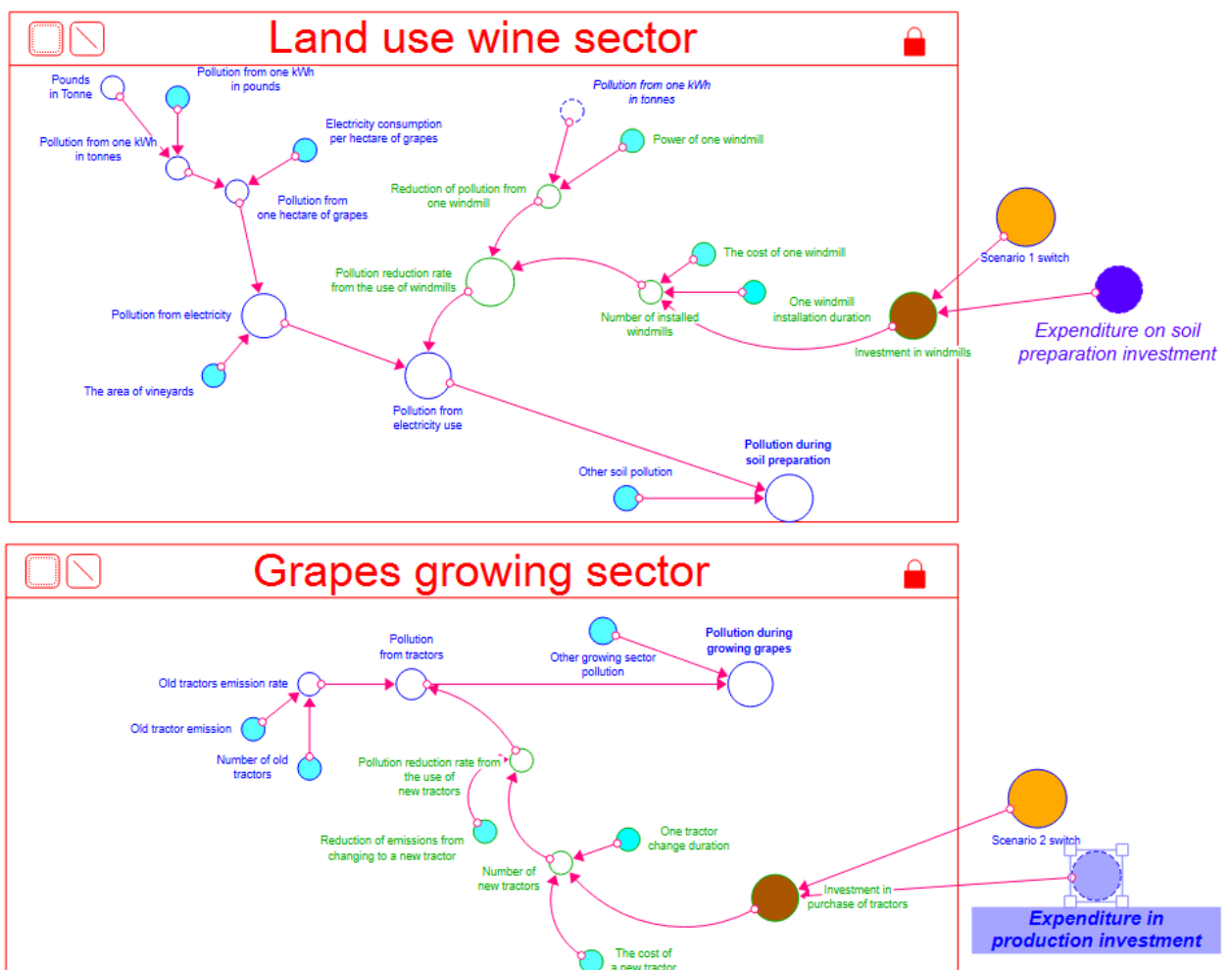


Figure 1. System dynamic model of land use and grapes growing sectors

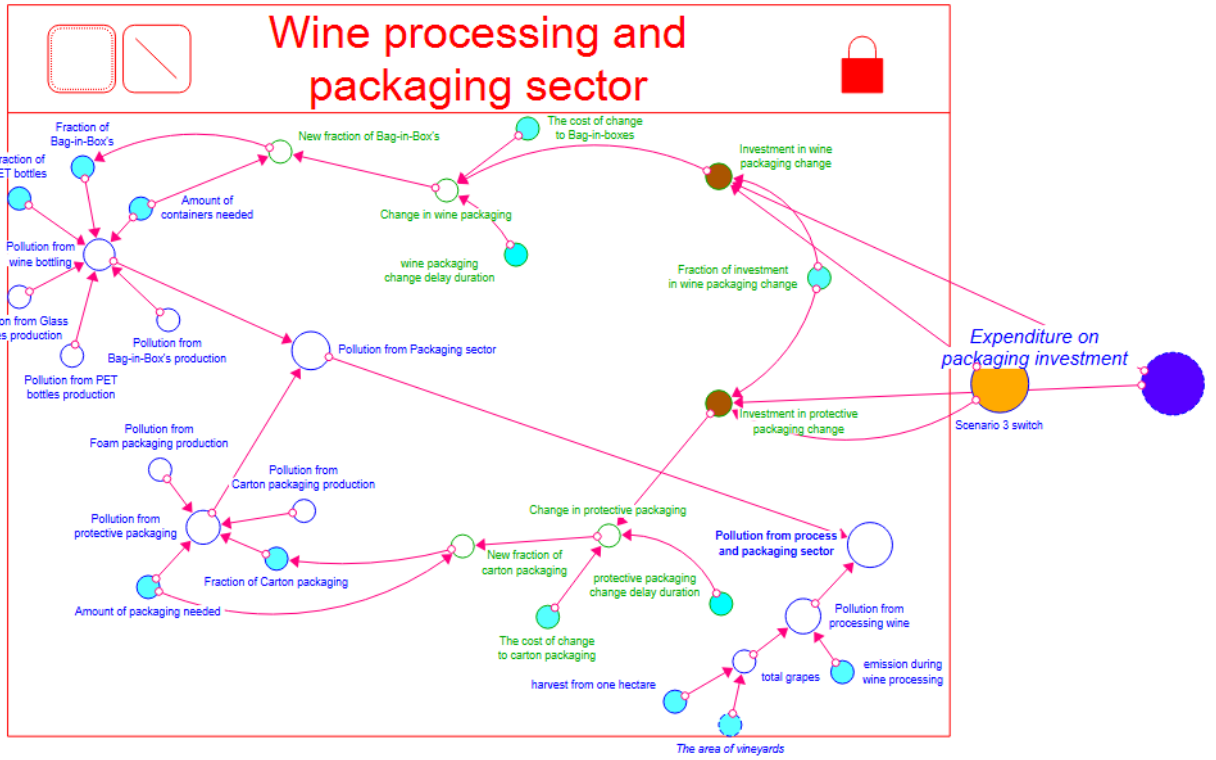


Figure 2. System dynamic model of wine processing sector

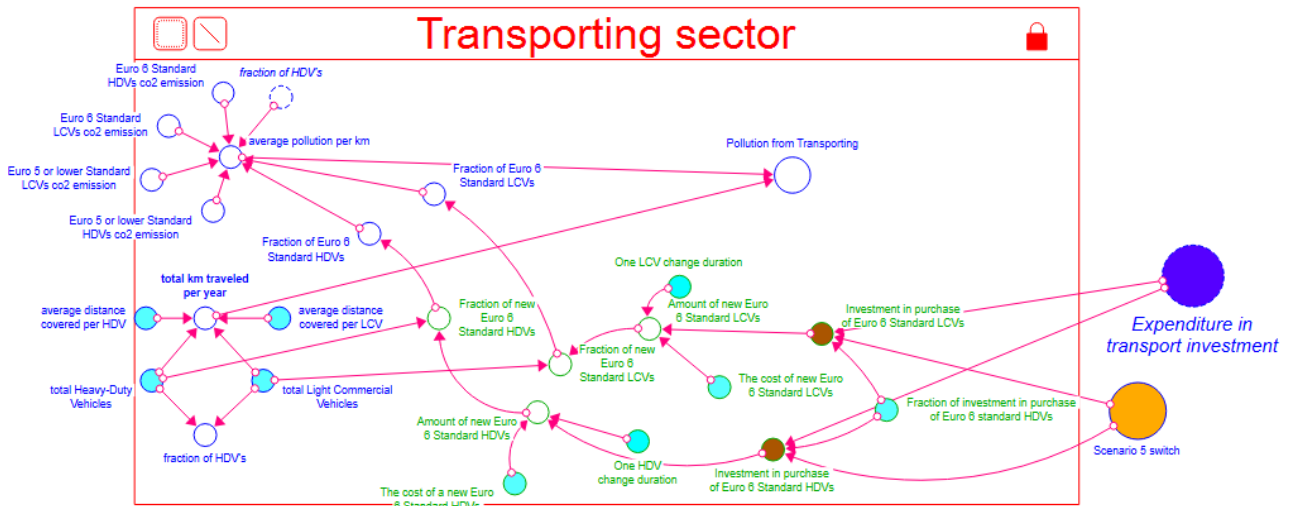
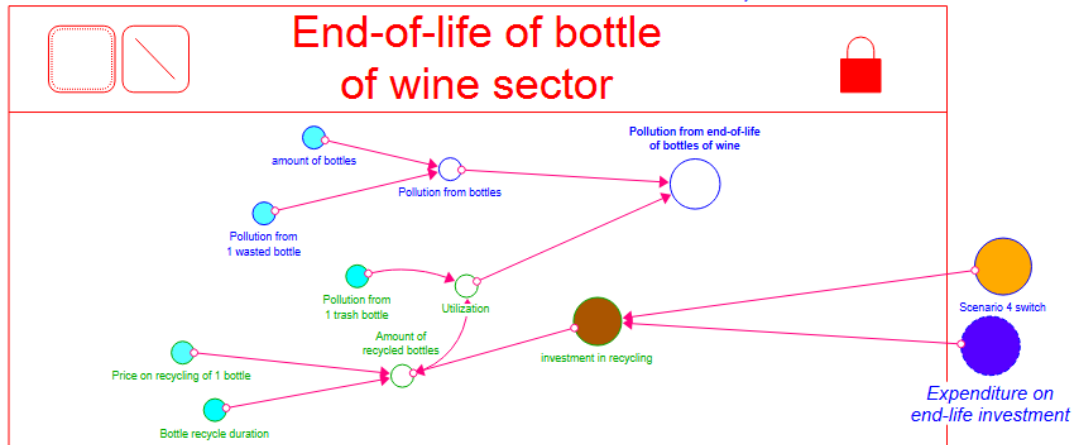


Figure 3. System dynamic model of transporting sector

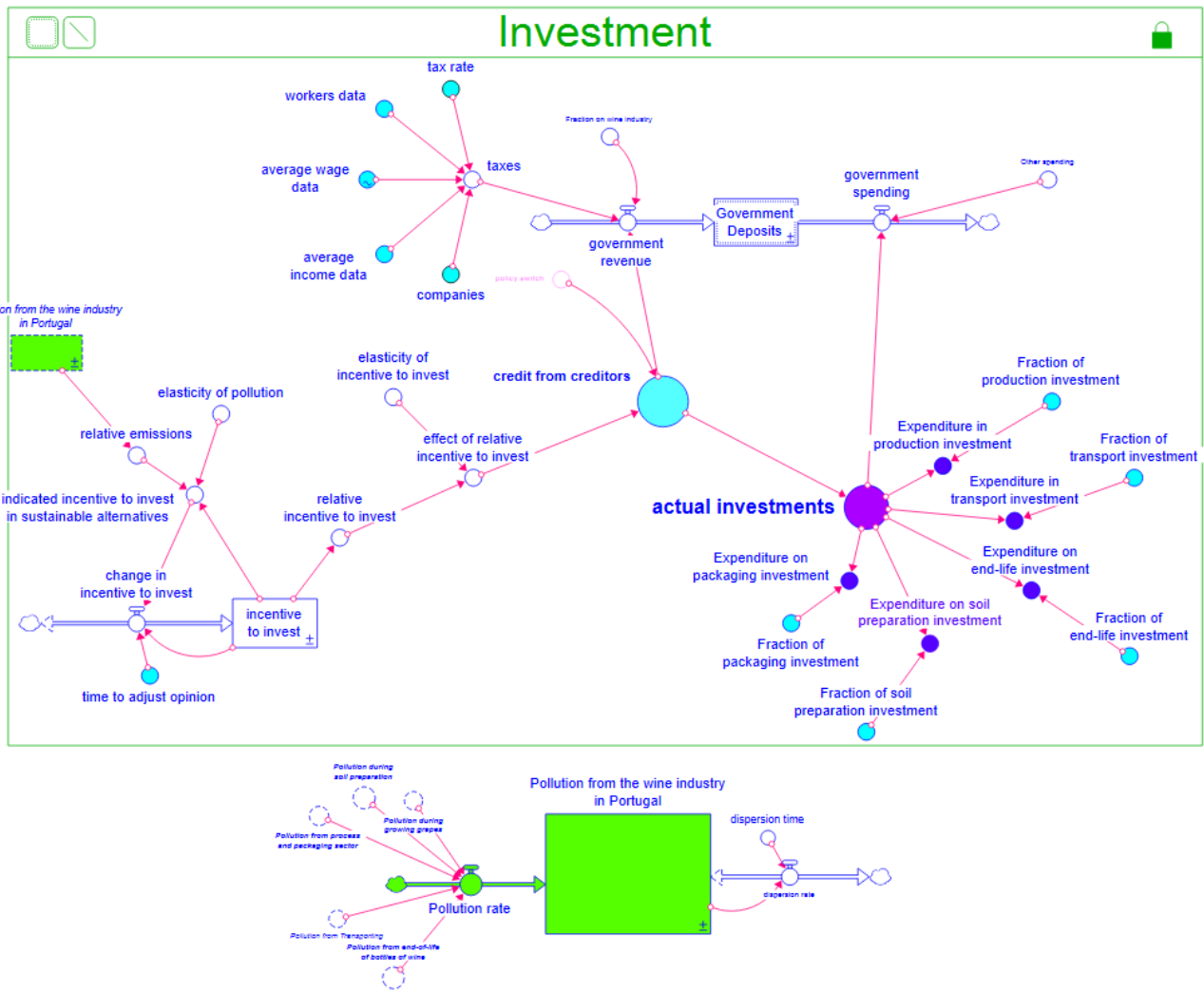


Figure 4. System dynamic model of investment sector

At the beginning there is no investment and emissions do not decrease by 2030, which leads to an increase in accumulated CO2 pollution in the atmosphere. Following this assumption, the wine industry in Portugal is increasingly using old equipment, electricity produced by hazardous enterprises, non-environmentally friendly packaging and old transport to transport wine.

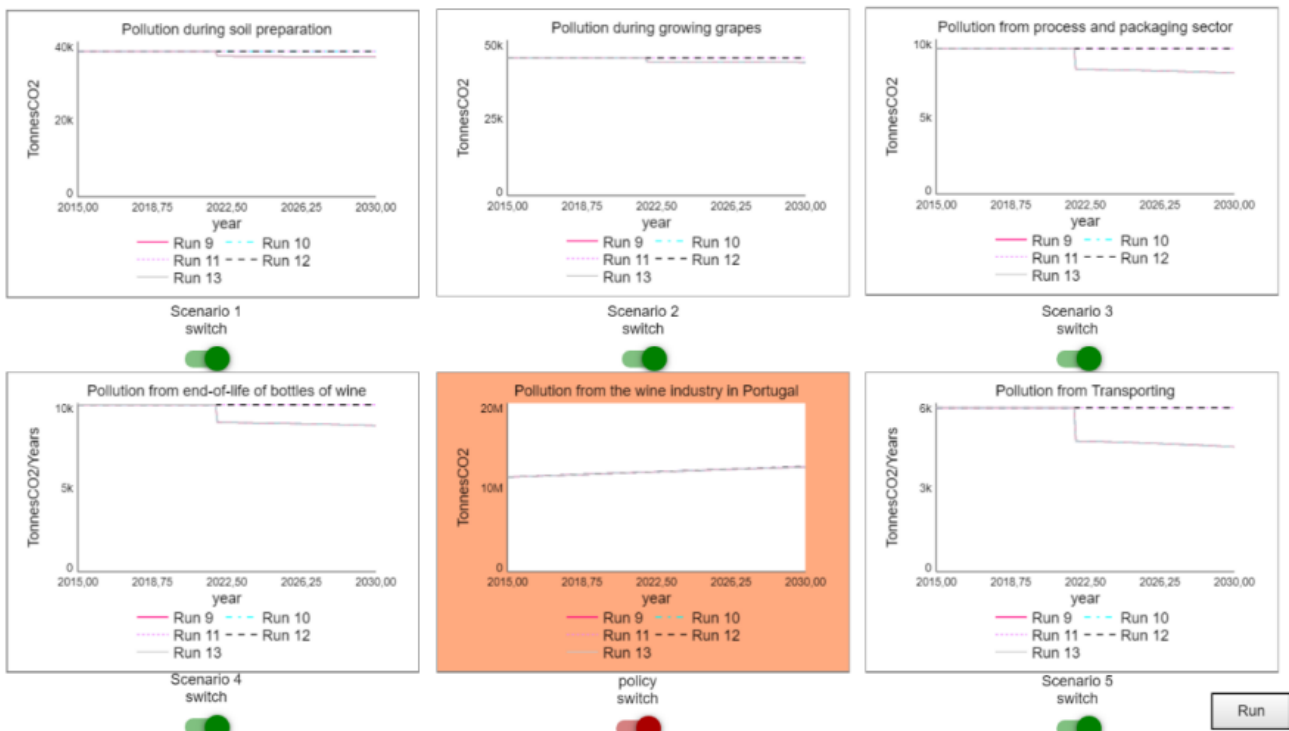


Figure 5. Interface with the main sectors of production of wine in Portugal

Moving forward, the investment is going to be included. How would it impact the situation? It will bring changes to all stages of wine production, covering the entire wine industry in Portugal. With help of investment emissions are reduced compared to 2020. The effect and amount of investment is gradually declining, due to the reduction of CO2 emissions in the wine industry in Portugal.

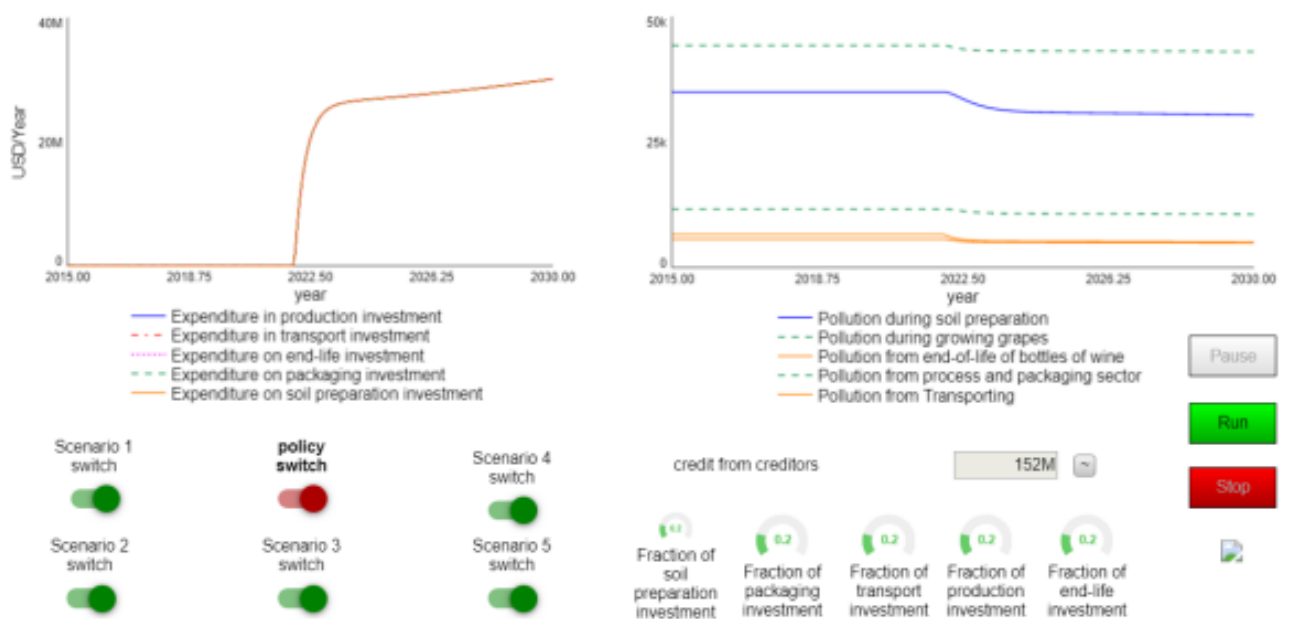


Figure 6. Comparing investment and pollution in model

Following the model there are several crucial recommendations about increasing of the investment for every sector of the production.

- Land use sector. Investment in wind turbines to ensure that the country's electricity is generated from alternative energy sources, which in turn will reduce CO2 pollution per hectare due to the use of electricity.
- Grape growing sector. Investment in the purchase of new equipment, the emphasis in the model is on the purchase of new tractors that will consume less fuel and will pollute the environment less.
- Processing and packaging sector. Investment in glass packaging for wine, as it is more environmentally friendly and easier to process after use. This will improve the situation in the bottle recycling sector.
- End-of-life bottle of wine sector. Investment in bottle recycling, as unused glass and plastic bottles also emit CO2. Also, in addition to air pollution, this creates a problem of storage and maintenance of landfills in Portugal, which is a relatively small country in Europe. Although bottles are not a staple in landfills, they are part of a global policy to reduce the number of landfills.
- Transportation sector. Increasing the use of environmentally friendly fuels and reducing overall fuel consumption, which creates significant CO2 pollution.

In general, the main variable is the amount of credit that can be obtained for the government, then using switches to distribute investment between sectors, there is ability to adjust policy during its operation.

References

1. Article «European Excise Rates and VAT on Wine», 2020: <https://www.wine-searcher.com/eu-wine-taxes>
2. Harvard T. H. Chan, School of Public Health « Water Pollution»: <https://www.hsph.harvard.edu/ehep/82-2/>
3. Weather Guard Lightning Tech «Wind Turbine Cost: How Much? Are They Worth It In 2022?», 2021: <https://weatherguardwind.com/how-much-does-wind-turbine-cost-worth-it/>
4. Liz Francis «The Carbon Footprint of a Bottle of Wine», 2017: <https://www.sestrasystems.com/carbon-footprint-of-a-bottle-of-wine/>
5. Press Release – Bortolomiol «EPD Environmental Certification in the Wine Industry», 2021: <https://www.winebusiness.com/news/article/244892>
6. Лук'яненко, І., Віт, Д. (2017). Системний аналіз формування державної політики в умовах макроекономічної дестабілізації.
7. Лук'яненко, І., Віт, Д., Оліскевич, М. (2020). Фінансова політика в умовах тінізації та дисбалансів на ринку праці: методологія та інструментарій.