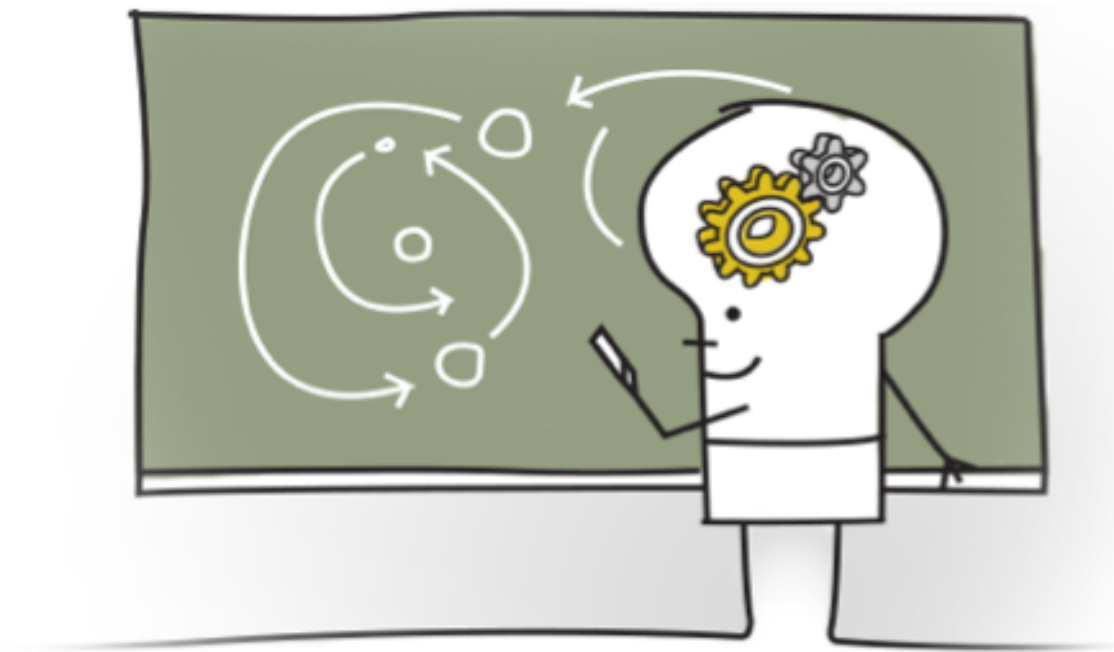# EFFECTS OF LOCKDOWN

System Dynamics: Modeling & Simulation for Development

Team Regulators

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INTRODUCTION

A lockdown is a restriction policy for people or communities to stay where they are, usually, due to specific risks, they pose to themselves or others if they move or interact freely. It is an emergency protocol to prevent people from leaving a given area. A full lockdown means that people have to stay where they are and not leave their place. This scenario usually allows essential services such as food supplies, ambulance services etc. to function without restriction to cater to people's needs.

The concept of lockdown has existed for a long time. It is used to control various natural and manmade situations such as terror attacks and pandemics. The practice of confinement was adopted by European countries like England and France during the 16th and 18th century to protect people from exposure to deadly disease from overseas. The latest lockdowns have happened throughout the world due to the outbreak of novel coronavirus. Various countries around the world including India announced emergency lockdown to curb the spread of the deadly virus. In this report, we study the effects of lockdown on the environment on its model dynamics.

ARTICLES

The effect of COVID-19 lockdown on the air environment in India

N. Gupta et al. in their paper study the effect of lockdown which was placed in India to control Covid-19 on air quality. They study the effect on various environmental parameters like aerosol, ozone, particulate matter, nitrogen dioxide, sulphur dioxide, carbon monoxide and temperature. Their work involves using raw data collected before and during the lockdown, preprocessing it and analysing it to gauge the impact of lockdown. Along with this, they have used satellite images collected from NASA for comparison of different parameters. They have observed that there has been a significant reduction in the temperature, humidity levels, particulate matter and gaseous pollutants. Since, most of the air pollutants can be attributed to transportation, industrial and economic activities, a significant reduction in these activities directly translated to reduced addition of pollution to the already severely affected atmosphere.

The good, the bad and the ugly of COVID-19 lockdown effects on wildlife conservation: Insights from the first European locked down country

In this study, Viola et al. have made use of the lockdown to understand how large scale shifts of human activities can impact wildlife. The authors have done a qualitative analysis of social media information with field data from multiple taxa, data from citizen science projects, and questionnaires addressed to managers of protected areas. While field data confirmed some positive effects of lockdown on wildlife such as reduced human activity allowing animals to explore new habitats, increase daily activity, increase in species richness in temporarily less-distributed habitats, higher breeding success, it also highlighted negative impacts of the Covid-19 crisis on wildlife. Lower human disturbance linked to lockdown was in fact seen beneficial for invasive alien species. Wildlife conservation activities to protect threatened taxa were also hampered. According to the authors, a reduction in these wildlife conservation activities could also translate to a surge in illegal wildlife killing.

COVID-19 lockdown: A ventilator for rivers

The author in his article notes that India's water bodies are in a poor state. An estimated 40 million litres of wastewater is entering rivers and water bodies in India; only 37% of it is being treated. The river Ganga, one of the most important rivers of India has shown remarkable improvements in water quality. Within 10 days of the nationwide lockdown signs of improvement in water quality started surfacing. Monitoring stations showed improved dissolved oxygen levels. For example, at Varanasi's Nagwa Nala, the DO levels were found to increase by an astounding 79 percent. The main cause behind this is attributed to the stoppage of dumping of industrial wastes in the water. Other activities such as tourism, fairs, bathing and clothing activities near the ghats were curtailed and this contributed to the decrease in water pollution.

Impact of lockdown measures during COVID-19 on air quality– A case study of India

In this paper, the variation in concentration of key air pollutants including PM10, PM2:5, NO2, SO2 and O3 during two phases, pre-lockdown and post-lockdown phases, was analysed. The air quality data for four stations of Delhi, four stations of Mumbai and a single station of Singrauli for the period from 1st March 2020 to 15 April 2020 was obtained from CentralPollution Control Board (CPCB) online portal. Delhi and Mumbai are metropolitan cities of India that are enlisted in the most polluted cities of the world (CPCB 2014). The concentration of PM10, PM2:5, NO2 and SO2 reduced by 55% ,49%, 60% and 19%, and 44%, 37%, 78% and 39% for Delhi and Mumbai, respectively, during the post-lockdown phase. However, Singrauli has not shown any significant reduction in pollution levels due to the presence of coal-based power plants nearby which were not

shut as being a part of the essential services.

Indirect impact of COVID-19 on the environment: A brief study in Indian context

In this paper, the researchers have studied the variation in air pollution and river quality with the induction of lockdown. The city under study for air pollution was Ghaziabad, which according to reports is one of the most polluted cities in India at par with Delhi. Ghaziabad is in first place with PM2.5 pollution level of 110.2 μg/m3 in 2019 compared to the permissible limit of 60 μg/m3 (for 24 h) (IQAir report, 2019). They have also discussed air pollution based on the air quality index. They have found that the $PM_{2.5}$ concentration in Ghaziabad has come down by 85%. The other pollutant concentrations have also come down significantly. The water pollution has come down and marine life has become more visible.

Why Covid-19 will end up harming the environment?

This article describes the long term effects of Covid-19 on the environment. The economic impact of Covid-19 will cause the rules and regulations for saving the environment to be loosened. The funds allocated for environment conservation would be redirected to other areas. In short, the small positive impacts of lockdown on the environment are short term.

Environmental effects of COVID-19 pandemic and potential strategies of sustainability

This paper by Tanjena Rume and et al. describes the positive and negative impacts of covid lockdown on the environment. There have been a lot of positive impacts on the environment due to covid lockdown. Aviation and cars are major sources of pollution, and due to none of them being in operation, air pollution has drastically decreased. Due to vehicles not being in operation, a lesser amount of crude oil is being used. The Ozone layer is recovering much faster. The NO2 and CO2 levels have dropped, causing lesser acid rains, decrease in respiratory diseases for many. Lockdown has stopped all industrial activities, and fishing activities, therefore the garbage being dumped into water and fishing is practically zero. This significantly reduces water pollution and encourages aquatic life to thrive and also gives us cleaner water.
The covid lockdown has also shown some negative impacts. Primarily an increase in biomedical waste. To disinfect the surroundings a huge biomedical waste is generated. There is an increase in the production of plastic materials such as gloves, PPE kits, face shields etc. and disposing of this leads to an increase in toxins to the environment.

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Polypropylene is used heavily in the preparation of N95 masks. Polypropylene when disposed of, ends up releasing a chemical that can persist for a long time in the environment called dioxin and also some other toxic elements. Also, due to lockdown, many establishments have postponed the recycling process which is causing a lot of garbage to be accumulated and this can cause diseases. Due to an increase in the use of disinfectants in the environment, these disinfectants are causing non targeted microorganisms to perish and this will cause an imbalance in the ecosystem.

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