

**The Lunar Development Cooperative-A Proposed Solution for Avoiding the Tragedy of the Commons.** M. R. Castle-Miller<sup>1</sup> and Brent Sherwood<sup>2</sup>

Lunar natural resource extraction has the potential to drive humanity's expansion into the solar system. However, these resources are finite, scarce, and, in the case of key volatiles, concentrated in only a few small locations. Without an effective governance framework, lunar resource use risks becoming a *tragedy of the commons*, where overextraction and mismanagement lead to waste and conflict. Additionally, the Moon may face a "resource curse," in which economic growth depends entirely on the market for a dwindling supply of resources.

This paper examines the political economy of non-renewable resource management on Earth to inform strategies for lunar governance. It analyzes how common-pool resource allocation mechanisms—especially those used for mineral deposits and groundwater basins in the American West—have successfully mitigated the tragedy of the commons and could be adapted for the Moon.

For example, mineral deposits in the American West were effectively managed under a set of informal "mining camp rules" developed by the initial miners. These rules were later codified into state and Federal law.[1] Moreover, similar informal property rights systems were developed by local appropriators for fisheries, groundwater basins, timber forests, and other resources.[2] The paper examines the circumstances in which successful resource management systems were developed to understand how they can be encouraged and supported for space resources.

It also explores historical cases of the resource curse, identifying factors that have led to economic instability and the policies that have successfully mitigated these risks. For example, it explores how Norway's application of severance charges, exploration incentives, and management of its sovereign wealth fund and other institutions helped turn oil wealth into sustainable prosperity.[3]

The paper concludes by proposing a governance framework, the *Lunar Development Cooperative (LDC)*, to ensure lunar resources are managed efficiently, equitably, and sustainably, preventing both the tragedy of the commons and the pitfalls of terrestrial resource economies while enabling the long-term expansion of space development.

The LDC would achieve these aims by serving as an infrastructure and public service provider for mem-

bers. Members will include any private or public space organization operating on the Moon that agrees to be contractually bound to certain rules. These rules will, in effect, operate as a regulatory framework for operations on the Moon, including the for natural resource development.

The LDC will be structured similar to other major infrastructure projects around the world, including special economic zones and port authorities. Its shares will be purchased by nations from around the world and by as many companies and individuals as possible.

The LDC will be organized as a public-benefit corporation, with its incentives aligned with the long-term interests of the lunar economy, society and environment. It will do this by imposing limits on the amount of control any one shareholder (nation or individual) may have, such as a 10% cap on total ownership. To prevent conflicts of interest, its revenue will be derived from increases in the total value of common pool resources (including land / natural resource deposits) and not from any trade in private goods. Finally, the LDC will be subject to strict accountability mechanisms.

The LDC will not have authority to regulate non-members activities. However, it will prevent interference with its members by clustering its infrastructure at key hubs near major resource deposits. It will also help encourage the development of responsible regulation by nation-states.

Therefore, the paper demonstrates how the LDC will be optimally positioned to encourage the development and codification of rules for natural resource use on the Moon. It will have the ability and incentive to formalize the norms that its members find effective and efficiently regulate lunar resources, avoiding both the tragedy of the commons and the resource curse.

## References

- [1] Libecap, G. Contracting for Property Rights (1989).
- [2] Ostrom, E. Governing the Commons (1990).
- [3] Moses, J. & Brigham, A.M., The Natural Dividend: Just Management of our Common Resources (2023).

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