

DIRECTED ENERGY WEAPONS (DEWs)**Prelims:** Science & Technology- Defence Infrastructure**Mains:** GS-III- Science and Technology - developments and their applications and effects in everyday life Achievements of Indians

in science & technology; indigenization of technology and developing new technology

- ▶▶ **Context-** Directed energy weapons or DEWs are among the next bunch of military technologies that the Defence Research and Development Organisation (DRDO) is working on.

What is Directed Energy Weapons?

- ▶▶ A **directed-energy weapon (DEW)** is a ranged weapon that damages its target with highly focused energy, including **laser, microwaves** and **particle beams**.
- ▶▶ Potential applications of this technology include weapons that target personnel, missiles, vehicles, and optical devices

DRDOs take on Directed Energy Weapons:

- ▶▶ DEWs would play a major role in future warfare.
- ▶▶ DEWs are extremely important today. The world is moving towards them.
- ▶▶ In the country too, DRDO is doing a lot of experiments.
- ▶▶ DRDO have been working in this area for the past three to four years to develop 10-kW and 20-kW [weapons].

Directed energy weapons could have several Main Advantages over conventional weaponry:

- ▶▶ Direct energy weapons can be used discreetly; radiation above and below the visible spectrum is invisible and does not generate sound.
- ▶▶ **Light is only very slightly altered by gravity**, giving it an almost perfectly flat trajectory.
- ▶▶ It is also practically immune to both windage and Coriolis force. This makes **aim much more precise and extends the range to line-of-sight**, limited only by beam diffraction and spread, and absorption or scattering by intervening atmospheric contents.
- ▶▶ **Lasers travel at light-speed** and have near infinite range and therefore, are suitable for use in space warfare.

- ▶▶ Laser weapons potentially eliminate many logistical problems in terms of ammunition supply, as long as there is enough energy to power it the laser ammunition supply is assured.
- ▶▶ Depending on several operational factors, Directed Energy Weapons may be cheaper to operate than conventional weapons in certain contexts.

Significance of Laser based or Microwave Based high-power DEWs

- ▶▶ Laser based or microwave based high-power DEWs can quietly disable enemy drones or missiles temporarily or permanently **without leaving physical debris.**
- ▶▶ In contrast, the ASAT or anti-satellite missile that the DRDO tested on March 27, killed an orbiting Indian target satellite and left hundreds of small pieces as debris for a few months.

Problems with laser weapons:

Blooming:

- ▶▶ Laser beams begin to cause plasma breakdown in the atmosphere at energy densities of around one megajoule per cubic centimetre.
- ▶▶ This effect, called "blooming," causes the laser to defocus and disperse energy into the surrounding air.
- ▶▶ Blooming can be more severe if there is fog, smoke, or dust in the air.

