The Development Alternatives World Headquarters, located in New Delhi, is one of the first buildings in India that aims at Zero Emissions. The building is best described as a living ecosystem: a fine balance of natural and man-made processes employing environment-friendly energy, material and water management methods. A living testimony to the vision, mission and commitment of Development Alternatives to creating a national future that is based on social justice and a cleaner environment. It is already becoming the benchmark for green buildings in India.

It is now widely accepted that the business decisions enterprises make should be based not only on the conventional financial factors such as profits or dividends, but must also consider the immediate and long-term social and environmental consequences of their activities. India, which is still a transition economy, has the opportunity to bypass the costly environmental mistakes of the industrialized world and get a head start in building a greener world by promoting the use of environmentally sound, affordable building materials and technologies.

Development Alternatives believes its newly reconstructed Headquarters building will set a standard for ‘responsible construction practices’ in India that will rely on the use of alternative, eco-friendly and cost-effective methods, technologies and solutions.

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**Green Solutions for GREEN BUILDINGS**

**Land Area**: 3116 sqm  
**Built Area**: 3096 sqm superstructure, 1526 sqm basement  
**Population**: 300 persons  
**Functions**: Offices, Resource Centres, Conference Facilities  
**Architect**: Asheek B. Lall - Architects  
**Design Team**: The Development Alternatives Family  
**Consultants**  
- Structural: Mr. Subir Roy Chowdhury  
- Electrical: M/s Kesar Kothari Associates Pvt. Ltd  
- Plumbing: M/s Krim Energy Services Pvt. Ltd  
- HVAC: M/s Abdul Hussain Consultants  
**Builders/Contractors**  
- Civil: M/s Gurbaksh Singh B.A. Builders Pvt Ltd  
- Electrical: M/s Shriam Engineers  
- Plumbing: M/s Yash Plumbing Engineers  
- HVAC: M/s Adhunik Vatankool Pvt Ltd.  
- Lift: M/s Vikram Trich  
- Lift: M/s Schindler  

This path-breaking project has been generously supported by the Swiss Agency for Development and Cooperation with whom Development Alternatives has a long term institutional partnership. It has also received funding from ACC Limited, India’s leading Cement Company, and the Holcim Foundation for Sustainable Construction. When completed, the building will house the new Centre of Excellence in Sustainable Housing and Rural Infrastructure.
What Is It that makes the DA World HQs so significant?

The new DA World Headquarters is probably the most sustainable building on the Indian subcontinent, its construction involving a wide range of resource conserving strategies that include:
- User defined norms and standards for thermal comfort, ventilation, lighting, waste management and water use for high worker performance while minimizing resource consumption, for example:
  - acceptance of indoor temperature range from 16°C to 30°C (vs. the interna- 
tional norm of 18°C to 28°C) that is relevant for tropical regions
  - maximum use of natural lighting and installation of high-efficiency lighting
  - systems

- Conservation measures that harvest, reduce, reuse, recycle and recharge the scarce
  - resources – energy and water – through:
  - maximum reuse of material from the previous HQ
  - total rainwater harvesting and ground water recharging
  - maximum use of local materials
  - total water harvesting and ground water recharging
  - innovative hybrid cooking system to maximize use of energy and water

The construction systems used are an inventory of innovative and green building materi-
- als and techniques that are easy to replicate in both urban and rural areas and therefore
  - ideal for the mass market which:
    - Employment production systems for easy-to-use, quality prefabricated elements for
      roofs, floors and walls which are eco-friendly
    - Use deconstructed and even onsite production methods innovated by DA such as
      utilizing debris from demolished buildings to make fly-ash and mud blocks
    - Use advanced, environment-friendly construction systems that conventional
      contractors can easily adopt, such as terracotta elements for fenestration
    - Wall building system by using building elements made by technology and skill-based small
      enterprises

A cutting edge prototype to showcase environmentally sound solutions for contempo-
- rary work space demands in urban centres of North India, the new headquarters building
design optimises use of local resources, materials and skills through the application of ad-
- vanced scientific and engineering
- knowledge.

DA's HQs exemplifies the social and environmental values that the organization
- promotes and seeks to fulfill the expectations of its partners, customers, peers
- and indeed the society at large by demonstrating:

Responsibility towards use of scarce natural resources
- all wood work and furniture uses timber from certified managed plantations
- all rainwater at the site will be collected for recharging the ground aquifer
- Recognition and promotion of local crafts in various building elements, e.g.
- terracotta elements for fenestration
- artisan based carpentry works

Promotion of sustainable livelihoods and local rural and peri-urban economies
- by using building elements made by technology and skill-based small
  - enterprises

An Eco-Architecture

Promotion of an inclusive approach in design in:
- the highly participatory process followed to design the building, which has
  - been fully documented, increasing ownership and responsible use by user
    - total compliance and transparency in processing statutory approvals
  - safety and security of personnel

Promotion of the principle of equal opportunities employment by providing:
- child care facilities for parents, especially working mothers
- security systems for women employees

Conforming to the highest standards of
- environmental and resource conservation
- safety and security of personnel
- total compliance and transparency in processing statutory approvals
- the highly participatory process followed to design the building, which has
  - been fully documented, increasing ownership and responsible use by user
  - total compliance and transparency in processing statutory approvals
  - safety and security of personnel
The building demonstrates a high degree of energy (and water) conservation while maximising the ecological health of the workplace by employing a lifecycle (“cradle to grave”) approach for selecting design and materials.

Reducing embodied energy by using less energy intensive building components such as compressed earth and fly ash blocks for walls, ferro-cement channels and shallow masonry domes for roofs and ceilings.

Reducing total operational energy needs up to 30% below conventional buildings by rationalizing energy requirements according to actual user preferences, optimizing orientation to maximize natural lighting, insulation and ventilation,

meeting remaining energy needs for lighting, heating, cooling, etc., through innovative systems that integrate renewable energy, hot water and the highly efficient hybrid HVAC system.

The building uses materials and construction technology that have low embodied energy. The structural system consists of a short span RCC frame with ferro-cement shells and shallow masonry domes, which significantly reduce the consumption of steel. The building also uses the earth excavated from the site, materials recycled from the earlier HQs, as well as fly ash waste from local thermal plants for masonry infill walls. All these are extremely low energy materials that can be processed into building components locally, thus involving minimum transportation. Over 90% of the building materials are sourced from regions neighbouring Delhi. Use illustrations (iii), (iv), (v) and (vi), these are presumably from a presentation or some other report.

Ecological quality and energy conservation

The DA World Headquarters seeks to serve as a model for enhancing the productivity of those who work in it while reducing the use of scarce natural resources such as energy, water and materials.

Embodied Energy

The construction industry and buildings, on account of increasing operational needs, account for 30-40% of the primary energy consumed in developed and rapidly developing economies; their resulting contribution to greenhouse gas emissions have become too significant to be left unattended. Buildings also account for one-sixth of the world’s fresh water withdrawals, one-quarter of its wood harvest, and two-thirds of its materials and energy flows. If “business as usual” methods of using glass, steel and aluminium, in large span tall structures continue unabated, the impacts on climate can only keep growing.

In pursuit of a more sustainable energy use trajectory, DA’s innovative HQs Building uses materials and construction technology that have low embodied energy. The primary strategy is to curtail heat gain through the building fabric by ensuring favourable orientation with respect to the sun’s trajectory and carefully designed shading and insulation of walls, windows and roof. Secondly, the building is “clothed” with plants on its eastern and western faces and on the roof. The window system is designed to allow altering the heat transfer properties by opening and shutting the inner leaf of double glazed panels to take advantage of favourable ambient temperature in some seasons.

Operational Energy for Indoor Environmental Control

In a climate like Delhi’s, with its highly variable temperatures and humidity, cooling, heating and reducing humidity in different seasons involve considerable energy – accounting for a major impact on the environment. The DA building employs two methods for minimizing energy use with innovative approaches for integrating the passive built fabric with its active systems. It is designed to save 40% in operational energy consumption.

Passive Energy Systems

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A SUSTAINABLE BUILDING

...Maximising performance, minimising resource use

1960s

1970s

1980s

1990s

2000s

The chart shows the evolution of low energy architecture and environmentally sustainable architecture from the 1960s to the 2000s.
Active Indoor climate control

In Delhi’s climate, the annual contribution to cooling load is about 70% by sensible heat as against 30% by latent heat. The active cooling strategy in the DA World HQ, therefore, uses evaporative cooling to address a substantial part of the sensible load. The evaporative cooling system is then coupled to refrigerant cooling to take care of remaining load during the humid months.

Additionally, the indoor air circulation system uses displacement ventilation with a heat recovery arrangement between fresh air intake and exhaust air. Insulation of the building fabric outside an envelope of high thermal mass makes for a flywheel effect on temperature fluctuations and allows night-flushing for storing coolness during seasons with large diurnal temperature range. The refrigerant cooling system is designed as an air-cooled direct expansion package unit.

The key component of this system is the “hybrid” package air-handling unit which would house the chiller, evaporative cooler, heat exchanger, air-circulating fan with damper controlled by-pass, and automated controls for balancing the operation of each of these components. This configuration is specially developed for this building but is ready for wide replication.

Refer illustration (vii).

Flexibility in design of the HVAC system allows compatibility with present and projected norms and standards, e.g., permissible refrigerants R-410 used in the modular system, can be changed as new and more stringent norms come into existence.

The combination of evaporative cooling for dry season (sensible heat load) and air-cooled refrigerant cooling for remaining loads also conserves water, critical in the face of growing shortages in the cities.

Water – Not a drop of waste water from DA will pollute the Yamuna

In an urban scenario, water is arguably the most precious of resources. The building actively integrates water saving measures on one hand and on the other ensures that water is recycled and utilized in irrigation of the landscape and all surplus treated water and rain water is sent into ground water recharge vaults to help maintain the depleting water table in the urban areas. Waste water and sewage from kitchens and toilets will be recycled and the surplus used for ground water recharge and the slurry/sludge used for manure.

Scarcity of land, water and materials have now become major national issues. The DA green building demonstrates methods to minimize the use of these depleting resources to the benefit of all, in terms of cost and energy savings and environmental and human health.
Economic performance

The DA HQ maximises economic benefits to users and promoters by reducing initial construction costs by up to 20% in civil construction and services below conventional contemporary construction through efficient design and optimum use of materials. Selecting low maintenance, high durability materials and finishes that provide long-term benefits to users and eventually to the environment, e.g.,

- stone instead of vitrified tiles for floors
- exposed brick finish without paints

Reduced operational costs by

- designing for secure access without large security staff
- using highly efficient lighting and air conditioning systems
- reducing energy costs for cooling and heating by appropriate passive design and incorporation of double glazed windows

Design and Building Management

Development Alternatives does not promote any particular style or aesthetic. Design is a process of discovery where solutions are found appropriate to a given building in a specific context. The process was driven by three guiding principles:

- Inclusion of the views of all user groups at all stages of the project by appropriately structured consultation
- Search for simplicity and economy of means
- Prioritizing selection of design strategies and technologies in favour of sustainability and energy conservation

To this end, the process of design thinking has been a partnership between Development Alternatives and the Architects, taking advantage of the experience and resources of Development Alternatives community.

The building is designed to be highly modular and flexible to allow it to be reconfigured as needed for changing work patterns and staff requirements:

- Each section of the building can be individually controlled for climate, ventilation and lighting
- Limited space for each workstation, generous arrangements for meetings, group work
- Advanced network design enables staff members to tailor connectivity and communications to their needs
- Flexibility in design of the HVAC system allows compatibility with present and projected norms and standards, e.g., permissible refrigerants R-410 used in the modular system can be changed as new and more stringent norms come into existence
- Procedures for operating the building codified and internalized by users to ensure that water and energy conservation is maintained
Development Alternatives is pleased to offer the innovative methods and technologies that it has employed in the new DA World HQ to all who might wish to take advantage of them – corporations, manufacturers of building products, architects and interior designers.

DA is a non-profit organization engaged in research and action for sustainable development. Established in 1983, it is part of the Development Alternatives Group which also includes Technology and Action for Rural Advancement (TARA), TARA Nirman Kendra (TNK), TARAhaat Information and Marketing Services Ltd. and Decentralized Energy Systems India Ltd.

The mission of the Development Alternatives Group is to promote sustainable national development. Its corporate objectives are to innovate and disseminate the means for creating sustainable livelihoods on a large scale, and thus to mobilize widespread action to eradicate poverty and regenerate the environment.

The activities of Development Alternatives cover a broad array of complex development issues requiring sophisticated, multi-disciplinary responses. To be able to provide such responses successfully, the Group has built up a strong capacity to identify developmental challenges confronting the nation and devise effective ways to address them. It has therefore, brought together a cadre of professional staff members with a wide range of skills and backgrounds but a common, solid commitment to excellence and team-work.

With almost 25 years of experience and over 400 professionals, the DA Group has had a profound impact on the creation of sustainable livelihoods, specifically in the innovation and application of appropriate technologies and their distribution through micro-enterprises in rural India.

Development Alternatives was founded in 1983 by Ashok Khosla, who established and headed the Government of India’s first environment agency, served as Director of Infoterra in the United Nations Environment Programme (UNEP) and has advised the United Nations, the World Bank and the Government of India. Currently, he is a member of the World Future Council and President of the Club of Rome.