Population Prediction

Introduction

This report presents the population estimation for a 90-acre dairy farm industrial park. It quantifies both present and future populations and will serve as the baseline for all subsequent engineering designs.

It maps the park's organizational hierarchy directly onto its physical layout. While the organogram outlines personnel down to the department level, this estimation disaggregates those numbers and distributes employees into individual buildings and facilities where they actively execute their shifts.

For the Residential wing, the calculation focuses strictly on the permanent on-site population. This includes:

1. Designated Residents: Occupants permanently residing in designated housing units (Villas and Types A through D).
2. Building Caretakers: Dedicated on-site staff (such as gatekeepers) assigned to each residential building (at least one per building) to manage access control, security, and routine maintenance.

Building Types

Category	Designation	Housing Allocation
Villa	Park Managing Director Director of total four wings Caretaker (two)	Executives Villa
A	Board Secretary Chief Legal Counsel Division Heads Divisional Chief Engineers/Officers Executive Assistant PR Officer Caretaker (one per building)	Type A Quarters
B	Chief Operators Department Leads Department Managers School Principal Superintendents System Administrator Training Academy Director Caretaker (one per building)	Type B Quarters
C	Administration Clerks Assistants Captains Commercial Operations Managers Coordinators Engineers Mosque Imam Officers Senior Accountants Supervisors Teachers Technical Staffs Caretaker (one per building)	Type C Quarters
D	Analysts Assistants Attendants Barbers Caretakers Cashiers Chemists, biologists Clerks Crew Drivers Field Agents Firefighters Guides	Type D Quarters

Category	Designation	Housing Allocation
	Handlers Herdsman Janitors Mechanics Nurses Operators Pharmacists Plumbers Receptionists Sales Reps Security Guards Staff Unloaders Yard Masters Caretaker (one per building)	

Assumptions

Residential Wing

Category	Family Members	Accommodation Provided (%)	Family Unit (%)	Bachelor Unit (%)	Employee Count	Household Population Growth Rate
Villa	8	100	100	0	7	1.0
A	5	80	80	20	23	1.0
B	5	60	60	40	47	1.2
C	6	60	50	50	150	1.4
D	6	50	40	60	357	1.5

Dorm Population

Population Growth After 10 Years	Population Growth After 20 Years	Population Growth After 30 Years
30%	35%	40%

Administrative Wing

Population Growth After 10 Years	Population Growth After 20 Years	Population Growth After 30 Years
25%	30%	35%

Commercial Wing

Population Growth After 10 Years	Population Growth After 20 Years	Population Growth After 30 Years
28%	33%	38%

Industrial Wing

Population Growth After 10 Years	Population Growth After 20 Years	Population Growth After 30 Years
30%	35%	40%

Sample of Calculations

Residential Zone

Type: Villa

- Present employee: 7
- Accommodation provided: 100% of 7 = 7
- Family unit: 100% of 7 = 7
- Bachelor unit: $7 - 7 = 0$
- Assumed family member: 8 people / family
- Total household population: $8 \times 7 = 56$
- Total dorm population: $1 \times 0 = 0$
- Household population growth rate: 1%
- Household population after 10 years: $56 \times \left(1 + \frac{1}{100}\right)^{10} = 62$
- Household population after 20 years: $56 \times \left(1 + \frac{1}{100}\right)^{20} = 69$
- Household population after 30 years: $56 \times \left(1 + \frac{1}{100}\right)^{30} = 76$
- Dorm population after 10 years: 30% growth; $1.30 \times 0 = 0$
- Dorm population after 20 years: 35% growth; $1.35 \times 0 = 0$
- Dorm population after 30 years: 40% growth; $1.40 \times 0 = 0$

Type: A

- Present employee: 23
- Accommodation provided: 100% of 23 = 23
- Family unit: 80% of 23 = 19
- Bachelor unit: $23 - 19 = 4$
- Assumed family member: 5 people / family
- Total household population: $5 \times 19 = 95$
- Total dorm population: $1 \times 4 = 4$
- Household population growth rate: 1%
- Household population after 10 years: $95 \times \left(1 + \frac{1}{100}\right)^{10} = 105$
- Household population after 20 years: $95 \times \left(1 + \frac{1}{100}\right)^{20} = 116$
- Household population after 30 years: $95 \times \left(1 + \frac{1}{100}\right)^{30} = 129$
- Dorm population after 10 years: 30% growth; $1.30 \times 4 = 6$
- Dorm population after 20 years: 35% growth; $1.35 \times 4 = 6$
- Dorm population after 30 years: 40% growth; $1.40 \times 4 = 6$

Type: B

- Present employee: 47
- Accommodation provided: 80% of 47 = 38
- Family unit: 60% of 38 = 23
- Bachelor unit: $38 - 23 = 15$
- Assumed family member: 5 people / family
- Total household population: $5 \times 23 = 115$
- Total dorm population: $1 \times 15 = 15$
- Household population growth rate: 1.2%
- Household population after 10 years: $115 \times \left(1 + \frac{1.2}{100}\right)^{10} = 130$
- Household population after 20 years: $115 \times \left(1 + \frac{1.2}{100}\right)^{20} = 146$
- Household population after 30 years: $115 \times \left(1 + \frac{1.2}{100}\right)^{30} = 165$
- Dorm population after 10 years: 30% growth; $1.30 \times 15 = 20$
- Dorm population after 20 years: 35% growth; $1.35 \times 15 = 21$
- Dorm population after 30 years: 40% growth; $1.40 \times 15 = 21$

Type: C

- Present employee: 150
- Accommodation provided: 60% of 150 = 90
- Family unit: 50% of 90 = 45
- Bachelor unit: $90 - 45 = 45$
- Assumed family member: 6 people / family
- Total household population: $6 \times 45 = 270$
- Total dorm population: $1 \times 45 = 45$
- Household population growth rate: 1.4%
- Household population after 10 years: $270 \times \left(1 + \frac{1.4}{100}\right)^{10} = 311$
- Household population after 20 years: $270 \times \left(1 + \frac{1.4}{100}\right)^{20} = 357$
- Household population after 30 years: $270 \times \left(1 + \frac{1.4}{100}\right)^{30} = 410$
- Dorm population after 10 years: 30% growth; $1.30 \times 45 = 59$
- Dorm population after 20 years: 35% growth; $1.35 \times 45 = 61$
- Dorm population after 30 years: 40% growth; $1.40 \times 45 = 63$

Type: D

- Present employee: 357
- Accommodation provided: 50% of 357 = 179
- Family unit: 40% of 179 = 72
- Bachelor unit: $179 - 72 = 107$
- Assumed family member: 6 people / family
- Total household population: $6 \times 72 = 432$
- Total dorm population: $1 \times 107 = 107$
- Household population growth rate: 1.5%
- Household population after 10 years: $432 \times \left(1 + \frac{1.5}{100}\right)^{10} = 502$
- Household population after 20 years: $432 \times \left(1 + \frac{1.5}{100}\right)^{20} = 582$
- Household population after 30 years: $432 \times \left(1 + \frac{1.5}{100}\right)^{30} = 676$
- Dorm population after 10 years: 30% growth; $1.30 \times 107 = 140$
- Dorm population after 20 years: 35% growth; $1.35 \times 107 = 145$
- Dorm population after 30 years: 40% growth; $1.40 \times 107 = 150$

Administrative Zone

Corporate HQ:

- Present population: 43
- Population after 10 years: 25% growth; $1.25 \times 43 = 54$
- Population after 20 years: 30% growth; $1.30 \times 43 = 56$
- Population after 30 years: 35% growth; $1.35 \times 43 = 59$

Commercial Zone

Retail & Café:

- Present population: 40
- Population after 10 years: 28% growth; $1.28 \times 40 = 52$
- Population after 20 years: 33% growth; $1.33 \times 40 = 54$
- Population after 30 years: 38% growth; $1.40 \times 16 = 56$

Industrial Zone

Truck Staging Yard:

- Present population: 17
- Population after 10 years: 30% growth; $1.30 \times 17 = 23$
- Population after 20 years: 35% growth; $1.35 \times 17 = 23$
- Population after 30 years: 40% growth; $1.40 \times 17 = 24$

Population of Residential Wing

Building / Facility	Corresponding Employees	Accommodation Provided (%)	Residential Employees	Family Count	Bachelor Count	People/Family*	Household Population Growth Rate (%)*	Household Population: Present	Household Population: In 10 Years**	Household Population: In 20 Years	Household Population: In 30 Years	Dorm Population: Present	Dorm Population: In 10 Years***	Dorm Population: In 20 Years***	Dorm Population: In 30 Years***
Villa	7	100	7	7	0	8	1	56	62	69	76	0	0	0	0
A	23	100	23	19	4	5	1	95	105	116	129	4	6	6	6
B	47	80	38	23	15	5	1.2	115	130	146	165	15	20	21	21
C	150	60	90	45	45	6	1.4	270	311	357	410	45	59	61	63
D	357	50	179	72	107	6	1.5	432	502	582	676	107	140	145	150
Total	**584**							**968**	**1110**	**1270**	**1456**	**171**	**225**	**233**	**240**

* Assumed

** $FutureHouseholdPopulation = PresentHouseholdPopulation \times \left(1 + \frac{GrowthRate}{100}\right)^{n}$; where, n is number of years.

*** $FutureDormPopulation = PresentDormPopulation \times \left(1 + \frac{GrowthInNYears}{100}\right)$

Population of Administrative Wing

Facility / Building	Population: Present	Population: In 10 Years**	Population: In 20 Years**	Population: In 30 Years**	Remarks
Security Checkpoint	2	3	3	3	Security & Traffic Wing
Inspection Bay	4	5	6	6	Security & Traffic Wing
CMS	12	15	16	17	Security & Traffic Wing
Logistics & Customs Office	12	15	16	17	Custom Clearance Wing
Veterinary Office	12	15	16	17	Biosecurity & Veterinary Wing
Parking Lot	16	20	21	22	Security & Traffic Wing
Exhibition Center*	150	188	195	203	Public Relation
Corporate HQ	53	67	69	72	Offices of governance body, wing directors, divisional heads, HR and finance department
Park Op. Center	5	7	7	7	Park Op. & IT Department
IT Center	5	7	7	7	Park Op. & IT Department
R&D Facility	8	10	11	11	R&D Department
QA Office	14	18	19	19	QA Department
Fire Station	16	20	21	22	Fire & Rescue Wing
Water Pump Station	6	8	8	9	Power & Water Department
Power Plant	9	12	12	13	Power & Water Department
Training Academy*	40	50	52	54	Academic Development

Facility / Building	Population: Present	Population: In 10 Years**	Population: In 20 Years**	Population: In 30 Years**	Remarks
Central Mosque*	400	500	520	540	Civil Services Department
Residential Estate Office	15	19	20	21	Housing Department
Solid Waste Dump	14	18	19	19	Environmental Department
Sewage Treatment Plant	9	12	12	13	Environmental Department
Total	**802**	**1009**	**1050**	**1092**	

* Assumed accounting for non-permanent personnels.

** $FuturePopulation = PresentPopulation \times \left(1 + \frac{Growth}{100}\right)$; where, $Growth$ is assumed total population increases (in %) over the given years.

Population of Commercial Wing

Facility / Body	Population: Present	Population: In 10 Years**	Population: In 20 Years**	Population: In 30 Years**	Remarks
Retail & Café*	40	52	54	56	Outlet Manager, Cashiers, Inventory Staffs, Kitchen Staffs
Food Court*	50	64	67	69	Supervisors, Cleaners, Supply Clerks
Shopping Complex & Super Market*	80	103	107	111	Operations Manager, Supervisors, Cashiers & Stock Clerks
Essential Services	14	18	19	20	Operations Manager, Laundry Technicians, Barbers, Pharmacists
Communication Services	14	18	19	20	Postal & Telecom Supervisors, Customer Service Agents, Technicians &Delivery Clerks
Bank*	50	64	67	69	Branch Manager, Loan Officers, Security Guards
Insurance	5	7	7	7	Insurance Lead, Field Agents
Veterinary*	15	20	20	21	Inventory Manager, Pharmacists, Sales Representative

Facility / Body	Population: Present	Population: In 10 Years**	Population: In 20 Years**	Population: In 30 Years**	Remarks
Daycare & Gym*	60	77	80	83	Supervisors, Caretakers & Instructors, Receptionists
Automotive Department	15	20	20	21	Maintenance Engineer, Mechanics, Technicians, Inventory Clerks
Park & Community Department*	250	320	333	345	Manager, Staffs, General Public
Education Department*	200	256	266	276	School Principals, Teachers, Clerks & Janitors
Health Department*	100	128	133	138	Medical Officers, Nurses, Lab Assistants
Total	**893**	**1147**	**1192**	**1236**	

* Assumed accounting for non-permanent personnels.

** $FuturePopulation = PresentPopulation \times \left(1 + \frac{Growth}{100}\right)$; where, $Growth$ is assumed total population increases (in %) over the given years.

Population of Industrial Wing

Facility / Body	Population: Present	Population: In 10 Years*	Population: In 20 Years*	Population: In 30 Years*	Remarks
Cow Barn A	15	20	21	21	Livestock Management Department
Cow Barn B	15	20	21	21	Livestock Management Department
Milking Rotary	10	13	14	14	Milking Operation Department
Milking Center Utilities	4	6	6	6	Milking Operation Department
Chilling & Filtration Block	7	10	10	10	Reception & Treatment Department
Raw Milk Silos	5	7	7	7	Reception & Treatment Department
Processing Core	30	39	41	42	Factory Production Department
Packaging Station	22	29	30	31	Packaging Operations Department
Bottle Inventory	9	12	13	13	Inventory Control Department
Cold Storage Warehouse	18	24	25	26	Warehouse Department
Shipping Docks	4	6	6	6	Dispatch Department
Truck Staging Yard	17	23	23	24	Dispatch Department

Facility / Body	Population: Present	Population: In 10 Years*	Population: In 20 Years*	Population: In 30 Years*	Remarks
Effluent Treatment Plant	13	17	18	19	ETP
Total	**169**	**226**	**235**	**240**	

* $FuturePopulation = PresentPopulation \times \left(1 + \frac{Growth}{100}\right)$; where, $Growth$ is assumed total population increases (in %) over the given years.

Summary of Population Prediction

Wing	Population: Present	Population: In 10 Years	Population: In 20 Years	Population: In 30 Years
Residential	1139	1335	1503	1696
Villa	56	62	69	76
Type A	99	111	122	135
Type B	130	150	167	186
Type C	315	370	418	473
Type D	539	642	727	826
Administrative	802	1009	1050	1092
Commercial	893	1147	1192	1236
Industrial	169	226	235	240
Total	**3003**	**3717**	**3980**	**4264**