Summary

This document attempts to establish the critical nature of the corpus fund worth Rs 500 Crore needed by GoMP from GoI for meeting the cost of further strengthening and augmenting the medical facilities currently being provided by GoMP to those individuals and their dependents that were affected by the Bhopal Gas Tragedy. The need for this fund is necessitated on both moral and legal grounds. On one hand GoMP stands committed to provide medical facilities to the Bhopal Gas Victims to the maximum extent possible while on the other hand it needs to meet legal obligation on behalf of GoI of catering to the medical needs of the victims and their dependents, free of cost, for all times to come and for any ailment whether or not they arise owing to inhalation of MIC. The need for the corpus funds is necessitated not only because of the burgeoning number of patients but also due to the resources required to provide medical care for serious ailments like Cancer, Renal failure, congenital diseases etc. Cost of providing both one-time treatment and the consequent follow-up for most of these diseases is exorbitant and needs to be met urgently.

GoMP intends to use the income from corpus funds to meet only the productive expenditure that directly meets the diagnostic and treatment needs of the patients, rather than meeting the administrative cost of providing the services.

1. Background

A. The Bhopal Gas Disaster

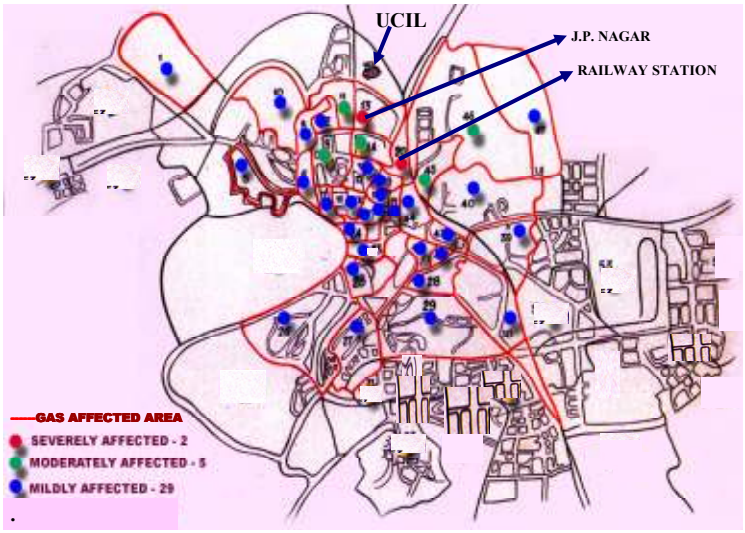
The Bhopal Gas disaster is one of the world's worst industrial catastrophe. It occurred on the night of December 2-3, 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, which was the Indian subsidiary of Union Carbide Corporation, USA. This tragedy occurred due to leak of Methyl Iso Cynate (MIC) and other chemicals from tank No. 610 where MIC was stored, due to ingression of water, and the resulting reaction. The medical professionals at Bhopal faced a situation which was unparalleled in the annals of medical history. Huge numbers of affected persons thronged the corridors of the hospitals; gasping for breath, frothing at mouth, congested watery eyes, unable to see clearly, retching and vomiting with fear and panic written large on their face. The ICMR estimated that out of a total 832904 population of Bhopal, 5, 21, 262 (62.58%) suffered from inhalational toxicity while 311642 (37.42%) escaped the effect of toxic gas. It was estimated that approximately 2000 exposees died in the first 72 hours and large proportion of the survivors suffered acute multi system morbidities- eyes and lungs being the main target organs. An estimate suggested that approximately 1, 00,000 persons residing in areas close to the Union Carbide Factory would have been exposed to relatively higher concentration of the potentially lethal toxic gas than the areas farther away. Predictably, a large proportion of population which survived this tragedy developed morbidity of varying degrees over the last 25 years.

B. Impact

Spatial Impact

In terms of spatial distribution, out of the total 56 municipal wards in Bhopal, 36 wards were affected by the gas tragedy. Of these 2 wards were severely affected, 5 were moderately affected and 29 were mildly affected. The remaining 20 wards were largely unaffected by the gas leak. A total of 5.74 lac persons were affected as a result of the tragedy.

MAP OF BHOPAL SHOWING 56 MUNCIPAL WARDS AS ON 1984



A brief profile of these wards is presented in the annexure.

Health Impact

The following initial observations[1] were made with respect to the impact of Gas Tragedy on the population;

- ✓ The observed mortality and morbidity pattern clearly indicated that the toxic gas was potentially lethal and may cause many more deaths and diseases in the near and distant future.
- ✓ It was most disturbing that nothing was known about the exact composition of the toxic gas or its antidotes.

[1] Synopsis of Technical Report on Population Based Long Term Clinical Studies, ICMR.

- ✓ MIC being a highly reactive chemical may adversely affect the pregnancy outcome, causing abortion, still births or congenital anomalies. There was also the possibility of incidence of cancer going up.
- ✓ A large number of exposees may suffer from chronic, progressive multi system morbidities and disabilities for a long time or entire life, it was feared!
- ✓ It was necessary to conduct clinical and epidemiological research studies to understand the etiopathogenesis and natural history of the morbidities caused, so that the rational method of therapy and prevention of serious disabilities could be evolved.
- ✓ There was an urgent need to strengthen, upgrade or create new medical and epidemiological research facilities in Bhopal.

C. Government Response

As an immediate relief, the state government provided financial support to affected families. To this effect, Rs. 12.80 crores was distributed amongst the affected families as immediate relief. In addition to this Rs. 19.20 crore worth of milk and grain was distributed free of cost amongst the affected families. Rs. 0.25 crore was spent as compensation for livestock lost and Rs. 37.8 crore was given to 3.78 Lac families of a deceased as compensation.

Till 1990, the state government spent Rs. 67.24 crores on the rehabilitation of the gas affected families from its own resources. Out of this Rs. 26.76 crores was spent on medical rehabilitation.

In the year 1990, first five year action plan worth Rs. 258 crores was sanctioned with a 75:25 share between centre and the state. This action plan was later extended till 1999.

This plan provided for Rs. 150.35 crore for medical rehabilitation in addition to economic rehabilitation (Rs. 21.18 crore), social rehabilitation (Rs. 49.72 crore) and environmental rehabilitation (23.76 crore).

After 1999 all the necessary expenditures related with rehabilitations have been borne by the state government. It has made expenditure to the tune of Rs. 321.22 (as on October 2010) from its own resources. Of the total expenditure made towards rehabilitation, about 85% (i.e. Rs. 273.78 crores) has been spent on medical rehabilitation.

2. Status of Medical Rehabilitation

The following section details the present status of infrastructure available to the gas patients. The section also presents an insight into the pressure on services being provided to the group.

A. Infrastructure

In the year 1985, the Bhopal Gas Relief and Rehabilitation Department was set up. The department subsequently established 6 big multi specialty hospitals and 9 day care centre;

Specialty Hospitals

The following table presents a list of hospitals providing specialty medical care to the affected population. These hospitals have been recording 100% occupancy against the bed strength. Additionally, in OPDs a doctor sees about 100-150 patients a day against a standard of 30 patients per day per doctor. This indicates towards a heavy patient pressure in these hospitals.

Also, with the given patient pressure and need for catering to changing disease profile, increasing strength of ICU and ICCU has been proposed.

Table: List of Hospitals

S. No.	Hospitals	Specialty	No. of Bed
1	Kamla Nehru Hospital	Super Specialty	219
2	Indira Gandhi Women & Children Hospital	Women and Children	150
3	Jawaharlal Nehru Hospital	Multi- Specialty	125
4	RAS Pulmonary Medicine Centre	Respiratory Diseases	50
5	Khan Shanker Ali Khan Hospital	General Hospital	60
6	Master Lal Singh Hospital	General Hospital	30
	Total		**634**

Day Care Units

The following table presents the list of day care units. These units have been placed in the gas affected localities to provide them with local centers for primary medical care. These centers require improved diagnostic and treatment facilities. Due to the limitation of the same, the patients have to visit the secondary and tertiary medical facilities leading to increasing pressure on the specialized facilities. This limitation in diagnostic facility at the primary centers also has an adverse effect on the early detection and treatment of serious ailments amongst the gas affected families.

Table: List of Day Care Units

S. No.	Day Care Unit	S. No.	Day Care Unit
1	K.N. Pradhan	6	Ibrahimganj
2	Putligarh	7	Rukma Bai
3	Bag Umrao Dulha	8	Ashoka Garden
4	Karond	9	Lal Bahadur Shastri
5	Kushabau Thakre, Narela Shankari		

Indian System of Medicine Dispensaries

In addition to the above, 9 institutions of Indian system of medicines including 3 dispensaries each of Ayurvedic, Homeopathic and Unani have been set up as indicated below:

Table: List of Dispensaries

S. No.	Location	S. No.	Location	S. No.	Location
Ayurvedic Dispensaries					
1	Lalghati	2	Tila Jamalpura	3	Chandbad
Homeopathy Dispensaries					
1	Kabitpura	2	Nariyalkheda	3	Tila Jamalpura
Unani Dispensaries					
1	Chhavni	2	Rafiquia	3	Kazi Camp

Bhopal Memorial Trust along with 8 mini unit was also set up to cater to the primary as well as specialty needs of the gas affected population of the city of Bhopal. These 33 medical units which provide medical assistance from primary to super specialty levels to the gas victims form a chain of hospitals whose density is one of the highest of government hospitals in any city outside the metros in the country.

B. Services

The total number of patients in attendance in OPDs in various gas related hospitals comes to over a million in a year. The average daily attendance in the OPD in the various units of Bhopal Gas Rehabilitation Hospitals is 3600. The average indoor attendance over the last 15 years has been approximately 32784. The annual total investigations carried by these hospitals of the Bhopal Gas Rehabilitation Department are approximately 2, 69, 355. The

following sub section presents the pressure on various services provided by the medical institutions.

Patient Pressure

The patient data of Gas Relief Medical Institutions is presented below. The table suggests an annual total OPD patients of around 12.5 Lacs with a daily average of about 3500 patients and In- patients of around 30, 000.

Table: Patient Data of Gas Relief Medical Institutions

S. No.	Year	Number of OPDs			Daily Average	No. of In Patients
		New Patients	Old Patients	Total Patients		
1	2009	734963	368050	1103013	3628	28342
2	2010*	690018	367019	1057037	3477	23774

***Up to October 2010.**

Medical Investigations

The facilities and the number of key medical investigations done at the centers are presented in the tables below. However, a lot of equipments and machineries require further editions in terms of numbers, maintenance and replacement. Also, there is a strong need

to further develop capacities in areas where an early detection can help in reducing the overall cost of treatment such as cancer etc.

Table: Medical Investigations done at the Hospitals in FY 2009-10 up to October 2010.

PFT	Ultra-Sonography	E.C.G.	Echo-Cardiograph	X-Ray	Endoscopy	Dialysis	C.T. Scan
148	**10294**	**9003**	**815**	**24218**	**1110**	**624**	**2088**

The following table presents the pathology investigations undertaken in the hospitals.

Table: Pathology Investigations done at the Hospitals in FY 2009-10 up to October 2010.

Blood	Urine	Stool	Sputum	Bio-chemistry	Serology	Bacteriology
106366	53553	543	4248	55817	6254	-

C. Research

In the initial period after the gas tragedy, there was very little information available about the effect of the gas on human body. This posed the treatment of patients as a major challenge. GoMP took the initiative and invited ICMR, New Delhi which in collaboration with Gandhi Medical College initiated about 24 research projects. The financial support for the research was provided by ICMR. After the scientific research the panel of scientists produced a working manual and the same is being utilized for treatment of the patients.

The Indian Council for Medical Research (ICMR) launched a series of long term Epidemiological and Clinical studies in the year 1985 and this went on till December, 1994. These ICMR studies were on 22 different subjects regarding long term effect and

impact of the gas leakage. ICMR also established a population based cancer registry in the department of Pathology, Gandhi Medical College, Bhopal, to estimate the instances of cancer to the affected population and also the population of rest of Bhopal.

After May 1995, the Government of Madhya Pradesh set up a separate research centre under Gas Relief Department named as Center for Rehabilitation Studies for carrying out medical research and to coordinate other research activities with other institutions on the subject.

Broadly, research has been taken up on the following aspects under the Center for Rehabilitation Studies;

a. Research on ailments in new born children.
b. Epideomological studies related with alleged water pollution around the factory.
c. Analysis of statistics related with the hospitals.
d. Studies related with pubertal growth
e. Study of persons severely affected by gas
f. Cancer Survey
g. Study related with eye ailments
h. Study related with newly born children

3. Disease Profile and Trends

This section presents the disease profile amongst the gas victims as evident in the short term and the changing trends in the disease profile in the long run.

A. Disease Profile and Trends

As discussed before, ICMR conducted several population based long term technical clinical studies between 1985 and 1994. The key findings of these reports are presented below;

i. In the acute phase of toxic gas exposure, 99% of the severely exposed patients suffered from breathlessness, cough, ocular symptoms and abnormal chest radiographs. They improved with time.

ii. Lung histopathology in 3 open lung biopsies after 3-4 months showed alveolar, bronchial and peri-bronchial lesions in the form of inflammation, destruction and fibrosis.

iii. In the sub-acute phase, impairment of lung function could also be demonstrated.

iv. A single one time inhalation of MIC/ toxic gas in a group of 119 severely exposed patients produced acute inflammation of airways and alveoli. The healing of acute lung injury resulted in alveolo-pleural fibrosis and airway constricting lesions much more in the peripheral / small airways less than 2 mm internal diameter than the central airways. Pulmonary disability was caused due by reduced FEV, psychogenic factors, physiological de-conditioning and malnutrition. In the future, such patients with evidence of residual lung damage might run a clinical course similar to COPD, with recurrent respiratory illnesses.

v. Acute exposure to MIC/ toxic gas resulted in alveolar and interstitial pulmonary oedema, inflammatory, bronchial and peri-bronchial lesions in chest radiographs- the

extent of lesions apparently was determined by severity of exposure. Following the exposure the chest radiographs started showing evidence of clearance. However, in the chronic phase, a proportion of cases were left with residual lesions, consisting of alveolar, interstitial, peri bronchial inflammation, destruction, fibrosis and airway narrowing.

vi. Study of a large sample of toxic gas exposed subjects compared with unexpected subjects suggested the following clinical diagnosis: Exposed vs Controls: chronic bronchitis – 17% vs 7%; bronchial asthama- 12% vs 5% classified as "Reactive airway dysfunction syndrome (RADS)"; unspecified lung disease including small airway disease- 57% vs 0.2%; pulmonary tuberculosis- 2% vs 1%.

vii. In the immediate post exposure period, nearly 50% of the population including children suffered from mental health problems. Most of them recovered. Five years follow-up studies revealed that the prevalence rates of psychiatric disorders were several times higher in the exposed areas than the control areas. These were higher in women than men, as also in higher than lower age groups. Though reduced, prevalence rates were still 3 times higher in exposed areas than control areas.

viii. The long term ocular morbidity studies showed that the toxic gas exposed resulted in ocular changes namely trachoma, chronic irritative conjunctivitis, corneal opacities, cataract – complicated in some cases with poly chromatic lustre and fundus abnormalities.

B. Change in Disease Profile

Based on the various epidemiological and clinical studies which have been carried out in the past 25 years as well as evidences that is emerging on a continuous basis, is briefly presented below;

i. Long term population based cancer registry has shown that there are over 3000 cancer patients who have developed this disease as a result of the gas tragedy. Similarly there are nearly 2000 patients of chronic renal failure who require specialized and high cost medical assistance.

ii. The MIC leak has its greatest impact on the respiratory systems. The number of people suffering from respiratory related diseases is more than 1, 00,000. This is supported by the studies carried out by the ICMR and various other research agencies and NGOs operating in the field in Bhopal. These patients require continuous monitoring treatment due to their reduced physical capacity because of permanent pulmonary problems.

iii. Continuous research has shown neurological deficiencies and Psychiatric disorders of almost 20 to 25% of the gas victims which exists as a concomitant co-morbidity amongst the gas affected population.

iv. Gastroenteritis, renal failure and cardiac diseases are rampant amongst the gas affected population. The incidence of these non-communicable diseases is much higher amongst the Bhopal Gas affected population than those of the normal population.

v. The studies done by the Centre for Rehabilitation Studies, Bhopal, in a report submitted in August, 2006 indicates that incidence of Lung Eye, GIT and General morbidities is 4 to 5 times more amongst the gas affected population than that of the people living in a control area in the city of Bhopal.

vi. Recent studies carried out by several NGOs and that of similar medical research has shown that due to toxic waste dumped by the Union carbide factory within the campus, the water around the carbide factory has got polluted and this has resulted in a large number of congenital malformation and this requires continuous and specialized treatment to these children. There is a plan to establish a congenital

malformation registry so that this category of children can be looked after, scientifically.

In addition to the above facts, it is also appreciated that even the general immunity status of the affected population has been comprised causing very high infection rate and therefore, medical rehabilitation on a continuous basis needs to be carried out over the next several years.

The detail of morbidity pattern and disease profile is presented in the annexure.

4. Latest Action Plan

This section details the recent support provided, resource allocation by the state government and resource gap for medical rehabilitation to the extent that is appropriate and desired for the gas affected population.

The Chemical and Petro-Chemical Department of the GoI sanctioned an action plan in 2008 submitted by BGTTRRD, GoMP. The detail of the sanctioned amount is as follows;

Table: Details of the Latest Action Plan

S. No.	Item	Amount (in Rs Crore)
1	Medical Rehabilitation	33.55
2	Social Rehabilitation	85.20
3	Economic Rehabilitation	104.00
4	Water Supply	50.00
	Total	**272.75**

Out of the 272.55 crores, 33.55 crores were provided under the medical rehabilitation head.

Details of the Medical Rehabilitation Plan

The following sub-section provides details of the estimates under the medical rehabilitation head and primarily covers the different equipments proposed under the action plan. The following table presents the hospital-wise sanctioned budget.

(Figures in Rs. Crore)

SN	Name of Hospital	Specialty	Building	Furniture	Equipments & Fixture	Total

1	Rasool Ahmed Siddiqui P.M.C	Respiratory Disease	0.40	0.10	2.05	2.55
2	Indira Gandhi Hospital	Women & Child	0.10	0.50	0.74	1.34
3	Jawaharlal Nehru Hospital	Multi-Speciality	0.40	0.10	3.62	4.12
4	Shakir Ali Khan Hospital	General Hospital	0.40	0.15	2.00	2.55
5	Master Lal Singh Hospital	General Hospital	0.10	0.20	0.69	0.99
6	Kamla Nehru Hospital	Super Speciality Hospital	0.50	1.15	19.12	31.27
		Total	**1.90**	**1.15**	**28.22**	**31.27**
Medical Research					**2.28**	
Grand Total					**33.55**	

Out of the Rs. 33.55 crores, Rs. 28.22 crores will be spent on medical equipment only for improving the medical services at the hospitals. The hospital-wise department-wise list of equipments is presented as follows;

Kamla Nehru Hospital

i. Nephrology Department

(Figures in Rs Lacs)

S.N	Name of Equipment	Cost
1	New Dialysis machines	32.00
2	Dialysis Chairs – 4	4.00
3	Blood Gas Analyser with Hb. Electrolyte attachment – 1	7.00
4	R.O. Plant 500 Ltrs./Hr. with tullu pump – 1	2.00
5	Multiparameter Cardiac Monitors – 4	12.00
6	Autoprocessor clean dialysis – 2	8.00

7	Computer System with printer – 1	0.50
8	One separate power backup/generator for dialysis unit	5.00
	Total	**70.50**

ii. Pathology Department

(Figures in Rs. Lakhs)

S.N.	Name of Equipment	Cost
1	Blood Cell Counter 5 part	12.50
2	Automatic Bacteria detection instrument	23.00
3	Identification & Sensitivity of Bacteria	14.00
4	Semiautomatic kemi-illumination instrument	5.00
5	Laminar Air Flow, Autoclave (Vertical- Double drum) Microscope (non- ocular & Binocular Both)	2.00
	Total	56.50

iii. I.C.U.

(Figures in Rs. Lakhs)

S.N.	Name of Equipment	Cost
1	Ventilators – 10	100.00
2	Fowler's Bed with cardiac ventilation support- 10	10.00
3	Cardiac Monitors SPO2 NIBP, Resp & CVP	30.00
4	Central Monitor – 1	5.00
5	Cardiac Colour Doppler machine with USG attachment & Vascular & S4, S* Flat & other probes	100.00
6	Defibrillator cum Monitor - 2	6.00
7	Aortic Balloon Pump - 1	10.00
8	Blood Gas Analyzer with Hb. & Electrolyte attachment	8.00
9	Pulmonary Function Test	2.00
10	Holtor Monitoring system – 1	3.00
11	TMT machine	3.00
12	Central Oxygen System (all wards & units)	100.00
13	C-arm	20.00
14	Portable X-ray	2.00
15	Syringe & IV Infusion Pump - 10	4.00
16	Autoclave – 1	0.20
17	Minor Equipment such as BP instruments etc.	5.00

18	Computer with Printer, scanner etc.	1.00
19	Hospital and General Furniture	5.00
20	Recurring expenses on consumable & other Supplies	
21	Ambulance Support One – Cardiac Ambulance having Ventilator & Defibrillator	50.00
22	Central Air- conditioning Split A.C. System 20 Tons	5.00
	Total	**469.20**

iv. Radiology Department

(Figures in Rs. Lakhs)

S.N.	Name of Equipment	Cost
New Equipment		
1	MRI 1-5 system with accessories	500.00
2	Digital Radiography system with IITV & Standing Buck with accessories	80.00
3	4-D Colour Doppler unit with Biopsy attachment to convex linear & TV/ TR porbes & Colour printer	60.00
4	Digital mammography unit with Sterotactic Biopsy attachment	80.00
5	Orthopurtotomogram	40.00
6	Mobilt 100 mA X-ray Unit- 2	10.00
Upgradation		
7	C.R. System existing 300 mA X-ray units	50.00
8	P.C. with printer	0.40
9	Recent Text Books and International journals on CT/MRI/ Ultrasound/ Doppler/ Radiology/ Intervention Radiology (lacs per year)	15.00 25.00
	Total	**860.40**

v. Opthalmology Department

(Figures in Rs. Lakhs)

S.N.	Name of Equipment	Cost
1	Digital Fluorescein Angiography unit with fundus camera of Carl/ Zeiss make or equivalent	50.00
2	O.C.T. (optical coherence tomography	25.00
3	Operating Microscope with zoom magnification with x-y compiling with post segment attachment lens BIOME	50.00

4	Posterior Vitrectomy machine	6.00
5	Cold Phaco machine unit or legacy/ oertelli	25.00
6	INOR's surgical instrument for ophthalmic surgeries (list attached)	5.00
7	Endolaser for sac surgery	5.00
8	Direct ophtalmoscope 6 units (B 200) with rechargeable batteries	0.70
9	Synaptophore (Keeler)	2.00
10	Goniscope- single mirror- 2, Pan fundus lens- 2	1.00
11	Corneal Topography	10.00
12	Lasik Laser for refractive surgery (complete unit)	200.00
	Total	**379.70**

Indra Gandhi Hospital

Department wise estimate-

(Figures in Rs. Lakhs)

Item/ Department	**Approximate cost**
Centralized Oxygen supply	25.00
Two Elevators	60.00
Establishment of Microbiology Lab	
Equipment	0.94
Reagents	0.55
Up-gradation of Biochemistry Lab	
Equipment	7.00
Radiology	56.00
Operation Theatre	24.00
Labor Room	05.00
Pediatrics	5.50
Total	**183.00**

i. Microbiology Lab, Operation Theatre and Radiology Department

(Figures in Rs. Lakhs)

S.No.	**Name of Equipment**	**Cost**

1	Incubator 37 degree centigrade – 2	0.20
2	Hot Air oven- two	0.20
3	Autoclave – 2	0.10
4	Terminal Flow	0.20
5	Gas Stove with cylinder- 2	0.10
6	Almirah – 3	0.05
7	Reagents Glass wares and other disposable	0.54
8	Semi Auto analyzer – 2	4.00
9	Calorimeter – 1	0.20
10	Air Cooler – 2	0.12
11	Inverter with battery – 2	0.40
12	A.C. – 4	1.00
13	Honda Generator electric	1.25
14	O. T. Table Hydrolic-2	6.20
15	Boyles apparatus – 2	0.10
16	Resuction Unit – 1	1.20
17	Formaline Vapour Box, Suction machine, revolving stool, steel basin, patient monitor system, surgical drum, steel bucket,	0.81
18	Shadow less light	0.70
19	Hydrolic door closer – 4	0.04
20	New Born Ambu bag – 4, Aqua guard, desert cooler, refrigerator, Split A.C., Window A.C. Kooker Curved Code No. 6	1.04
21	Pulse Oxymeter – 2	1.00
22	Defibrillator	2.00
23	Colour Doppler with TVS probe with Printer	30.00
24	Digital X-ray Machine – 1	15.00
25	Almirah &Furniture including sonography tables	5.00
	Total	**71.45**

ii. Pulmonary Medicine Center

(Figures in Rs. Lakhs)

S.No.	Name of Equipment	Cost
	List of Obsolete Equipments and Cost of Replacement	
1	TMT Machine	25.00
2	PFT Machine	25.00
3	Color Doppler with all prove & Biopsy attachment with digital camera	30.00
4	Five multipara monitors(Oxygen saturation, ECG tracings, Heart rate, Noninvasive blood pressure	6.75
5	Arterial blood gas analyzer	3.00
6	Trade mill with monitors for heart rate, calorimeter and milometer	1.25
7	Ergo meter(cycle) with monitor	1.25
	Total	**92.25**
	Purchase of Equipments	
1	Ambu bag	0.21
2	Portable X-Ray machine	1.30
3	Digital X-Ray machine with IITV & with Accessories	48.00
4	Laryngoscopes	0.24
5	Central Oxygen Supply	25.00
6	Pulse oxymeter – 4	0.82
7	ECG machine with computerized interpretation Model No. 8408 BPL	2.20
8	Adjustable ICU beds-12	0.60
9	One portable spirometer	0.05
10	Generator for continuous power supply	5.00
11	Haemotology Analyser	1.50
12	Vibrator	0.06
13	Short wave diathermy	0.21
14	Shoulder wheel	0.06
15	Respiratory Exerciser Electronic	0.38
16	Digital photo Kelorimeter	0.25
17	Intercom (12 line)	0.20
18	Inverter 1500 watt – 10 No	2.00
19	AC 1.5 Ton – 10 & AC 2.0 Ton – 6	8.00
20	Tubewell	1.50
21	Almirah -12 No.	0.60
22	Photocopier Machine	1.50
23	Furniture/fixtures including chairs, tables, cabinates etc. for all the rooms.	20.00

	Total	**113.86**

Jawaharlal Nehru Hospital

(Figures in Rs. Lakhs)

S.No.	Name of Equipment	Cost
1	Chemistry analyzer	2.00
2	Microscope- 2	0.40
3	Opthalmoscope	0.15
4	C-Arm	2.00
5	Dental Chair	5.00
6	Colour Doppler	18.00
7	Digital X-ray Machine	20.00
8	Portable X-ray machine	1.30
9	C.T. Scan	200.00
10	Ventilator	10.00
11	Monitor with Central Station	25.00
12	Pulse Oxymeter	1.00
13	Bayles apparatus	2.00
14	Twins Ceiling Light (O.T. Light)	1.00
15	O.T. Table Hydrolic	2.00
16	Ambulance- 2	5.40
17	ICU beds	3.00
18	Oxygen Cylinder	0.45
19	Stretcher	0.10
20	Diathermy machine	1.00
21	Computer	1.20
22	Photocopy machine	1.00
23	Fax Machine	0.07
24	Fridge- 3	0.60
25	De-Freezer	0.45
26	Generator-2	2.00
27	Fire Extinguisher- 40	1.00
28	Furniture for Canteen, Patients waiting hall, Library, enquiry room, meeting hall etc.	50.00
29	Lift- 2 (construction and installation	5.00
	Tolal	**361.12**

Master Lal Singh Hospital

(Figures in Rs. Lakhs)

S.No.	Name of Equipment	Cost
1	Digital x-ray machine including furniture and fixtures	20.00
2	Colour Doppler including furniture and fixtures	16.00
3	Spectro meter including furniture and fixtures	1.00
4	Computerized Cell counter	2.50
5	Culture Auto clave	2.50
6	Pathology Lab including furniture and fixtures	1.50
7	16 Channel ECG Machine	2.50
8	Pulse Oxymeter	2.50
9	Multi channel Cardiac monitor with accessories	0.60
10	Mechanical Syringe with other accessories	1.50
11	Portable Defibrillator with accessories	3.50
12	Blood Gas Monitor	3.50
13	Electrolyte monitor	2.50
14	Central Oxygen Supply	2.50
15	Generator	3.50
16	Furniture and repair of furniture	1.00
	Total	**66.60**

Khan Shakhir Ali Khan Hospital

(Figures in Rs. Lakhs)

S.N	Name of Equipment	Cost
1	A.C. – 6	2.00
2	Intercomm Telecom Service	1.00
3	Generator set – 1	1.00
4	Elevator – 1	30.00
5	TMT Machine – 1	3.00
6	Color Doppler – 1 with accessories	16.00
7	ECG Machine – 1	0.30
8	Glucometer	0.25
9	Central O2 supply system ICU Beds – 1, Beds – 4, Defibrillator, Nebulizer, Ventilator	40.00
10	Digital X-ray Machine – 1	70.00

11	O.T. Table-2 shadow less lamp, suction machine	3.00
12	Boyles Apparatus Major – 2	0.10
13	Shadow less Lamp – 2	1.40
14	Suction Machine – 2	0.10
15	Pulse Oximeter – 2	1.00
16	Paediatric Circuit Jackson REES – 1	0.10
17	Nitrous Oxide Cylinder – 3	0.15
18	Direct Opthalmoscope – 2	0.07
19	Indirect Opthalmoscope – 1	0.02
20	A Scan – 1	1.50
21	B Scan – 2	1.50
22	Phakco emulsification – 1	0.10
23	Microsurgical Instrument	0.05
24	Diamond Knife – 6	0.15
25	Angle Keratome+crescent blade – 6	0.10
26	Patients Examination Chair – 2	0.30
27	Automated Vision Drum – 2	0.05
28	Fundus Camera – 1	0.30
29	Low vision aid set – 1	0.02
30	Humpreys Automated Perimeter – 1	0.03
31	Applanation Tono meter	0.03
32	Specular Microscope	0.15
33	Digital Camera	0.30
34	Automatic Analyser	1.50
35	Automated Coagulation Analyser	1.00
36	Elisa Reader	0.50
37	Microbiology, Bacteriology culture	0.80
38	Plaster cutter	0.03
39	Physiotherapy wax bath	0.30
40	Shorter wav diathermy	1.00
41	Ultravav diathermy	3.00
42	Orthpedic table	1.00
43	Image intensifier	1.00
44	Endoscope for upper GI, Colonoscope	4.00
45	Cautery Machine	0.50
46	Double Drum Autoclave	0.30
47	Surgical Drum 9x9	0.12
48	Flexible Fibreoptic Laryngoscope	1.00
49	Electric drill with micromotor, hand piece and Burr points for ear	1.00

50	Nasal Endoscope	2.00
51	Computer with printer	0.70
52	Ambulance(ICU and Trauma Unit)	5.00
	Total	**200.32**

Genetic Lab

i. Washing Room

(Figures in Rs. Lakhs)

S.N.	Item	Cost
1	Autoclave	1.50
2	Hotair oven	0.50
3	Water purification system (Millipore)	5.00
4	Water distillation assembly	1.50
5	Ice maker machine	2.50
	Total	**11.00**

ii. Cytogenetic Laboratory

(Figures in Rs. Lakhs)

S.N.	Item	Cost
1	Laminar flow	Rs. 1.25
2	Centrifuge(2)	Rs. 0.75
3	CO2 incubator	Rs. 3.75
4	Refrigerator (4)	Rs. 1.25
5	Deep freeze – 20 degree centrigate	Rs. 3.50
6	Ph meter (2)	Rs. 1.25
7	Magnetic Stirrer(4)	Rs. 1.25
8	Weighing balance	Rs. 2.00
9	LPG Connection	Rs. 0.25
10	Microscope with microphography and cytovision software (for chromosome sorting)	Rs. 15.75
	Total	**Rs. 31.00 lacs**

iii. Nucleic Acid Preparation Lab

(Figures in Rs. Lakhs)

S. No.	Item	Cost
1	-20 and 80 degree centrigate deep freezer	Rs. 10.00
2	Refrigerated Centrifuge	Rs. 4.00
3	Vortex machine cum centrifuge (3)	Rs. 2.00
4	Water bath (2)	Rs. 0.40
5	Shaker incubator	Rs. 5.00
6	Horizontal gel electrophoresis apparatus with power pack(4 to 5)	Rs. 2.50
7	UPS	
8	Spectrophotometer/nandrop	Rs. 5.60
9	Microwave(2)	Rs. 0.20
10	Dry heating block	Rs. 1.30
	Total	**Rs. 31.00**

iv. Genome Analysis Lab

(Figures in Rs. Lakhs)

S.N	Item	Cost
1	Thermal cycler – 2 (PCR machine)	Rs. 7.50
2	Automated DNA sequencer	Rs. 31.00
3	Gel documentation system	Rs. 6.00
4	Horizontal gel electrophoresis apparatus	Rs. 2.50
5	Centrifuge/mini spin/ cooling centrifuge	Rs. 5.00
6	Real time PCR	Rs. 19.00
7	Thermo mixer	Rs. 4.00
8	Laminar flow	Rs. 5.00
9	UPS(10,5,3 and 2 KV on line)	Rs. 6.00
	Total	**Rs. 86.00**

5. Rationale for the Corpus

The provisions for the Bhopal Gas Rehabilitation Hospitals under different heads for the year 2010-11 compared to the increased annual requirement form 2011 -12 on account of extra facilities being provide through the procurement of new equipment is presented in the table below. The table indicates a total deficit of Rs. 42.5 crores.

(Figures in Rs. Crore)

S. No.	Head	Funds Allotted	Funds Requirement	Funds Deficit/ Requirement
a.	Medicine	8.95	45.00	36.05
b.	Hospital Equipment Replacement	3.07	5.00	1.93
c.	Equipment Maintenance and Consumables	3.13	6.00	2.87
d.	Computerization, Networking and Smart Card	3.35	5.00	1.65
e.	Electricity and Water Supply	2.00	2.00	0
f.	Building Maintenance	1.29	1.29	0
g.	Professional Services	1.45	1.45	0
h.	Human Resource	26.82	26.82	0
i.	Alteration/ Renovation of Buildings	5.93	5.93	0
	Total	**56.00**	**98.49**	**42.5**

There may be an increase in the human resource, professional services, building maintenance and alteration / renovation of buildings head. These would be completely borne by the state.

Justification for Corpus Fund

Here it would be meaningful to explain some factors which would also add to the need for the corpus / annual additional requirement of funds. Firstly, there is no reduction in number of patients over the years. The data from the hospitals suggest that the number of OPDs and inpatients have been gradually rising. Secondly, the hospitals under the department are expected to provide investigation and treatment facilities to non gas

patients as well. In cases of BPL families or members of families of ex-servicemen, the same has to be provided free of cost. With increasing facilities at these hospitals, it is expected that the number of such patients would also increase. This would require recurring additional resources.

A detailed explanation for the additional amount, by budget head, is presented as follows;

a. Medicine

i. Routine Medical Treatment

There are 6 gas relief multi specialty hospitals and 9 day care centre where about 13 lakh outdoor and 33000 indoor patients are being treated per year. The routine treatment includes both routine investigations as well as medications. At present the hospitals are not equipped to offer some of the facilities being requested under the latest action plan and the same is also not being outsourced due to paucity of funds. Once these facilities are established, the number of patients will increase leading to additional expenditure on medicines.

Each indoor patient requires medical support ranging between Rs. 500 and Rs. 1000. As the hospitals cater to between 30000 and 33000 indoor patients annually, for routine medical indoor treatment this would be costing about Rs. 3 crores

Some investigation facilities, however, would not be available in these hospitals, including inter alia, all kinds of hormonal assays, microbiological investigations and MRI requiring dependence on external agencies. It has been estimated that the cost of routine medical investigation and treatment varies from Rs. 100 to Rs. 150 per patient. With availability of

funds, outsourcing of some of the facilities would also become possible. Therefore, catering to approximately 13 lakh OPD patients cost (including the cost of investigation outsourced) of routine medical treatment would be around 14 crores.

In addition the hospitals also carry out a range of routine surgical interventions entailing an expenditure ranging from Rs. 500 to Rs. 1000 per patient which rises to Rs. 3, 000 to Rs. 10,000 per patient in case of major surgeries. With increase in facilities, there is expected to be a resulting increase in patients. The increasing number of surgeries will require additional expenditure on medicines and investigations. The estimated expenditure for about 3000 major surgeries (like general, orthopaedic, ophthalmic, gynecological surgery etc) in the department would be requiring Rs. 2-2.5 crores. Similar number of minor cases would require Rs. 50 Lakhs. Therefore, the total estimated cost for surgeries would come to approximately Rs. 3 crore per year.

To provide routine medical facilities for outdoor patient, indoor medical patients and indoor surgical patients would require about 20 crores per annum.

ii. Specialized treatment for severely ill patients

It is estimated that 10-15% of the gas affected population are suffering from chronic illness. Hence, there are about 2 lakh gas victims who have been suffering from chronic ailments like the COPD (Chronic Obstructive Pulmonary Diseases), Cardiac diseases, Cerebro Vascular Accidents, Respiratory failure, Pulmonary tuberculosis, Paralysis, Chronic Gastro Intestinal Disorders,

Chronic Arthritis, Chronic Skin Disease, Psychiatric cases etc. This type of patients require long term admission, investigation etc.

Out of these 2 lakh chronic ill patients, about 5000 patients belong to the critical category. These patients are treated in ICU or ICCU or in continuous supervision mechanism. As the Gas Rahat Hospitals' ICU/ICCU have been recording 100% occupancy, continuous treatment and follow up is not possible due to lack of beds and recurring expenses. The department is in the process of operationalizing a separate 10 bedded ICCU. Once this become operational, there will be an additional burden of investigation and treatment for such patients which will entail substantially high recurring cost.

Further, the department runs a dedicated hospital for respiratory diseases. The number of chronic respiratory cases amongst the gas exposed population is very high and calls for additional super specialty treatment. The gas relief department has established separate dedicated hospital for such kind of patients named as pulmonary medicine center. Looking at the requirement, the department plans to establish an additional 8 bedded ICU.

The cost of establishing these 18 beds is Rs. 2.75 crores which has been provided under the new action plan mentioned before. Once these 18 beds are operationalized, the investigation and treatment cost will increase due to increase in patient size. Such critically ill 5000-6000 patients require long term treatment round the year and the estimated cost incurred per patient is about 25000- 35000 per year. Therefore, with increased number of patients there will be a requirement of almost 15 crore

iii. Super specialty treatment for cancer and renal patients

Renal Patients

There are 4 dialysis machines available in the department out of which only 3 machines are in working condition. Of the three machines only two machines are being used for one shift only because of budgetary constraints. The number of renal patients being catered by the institution is definitely less as compared to their actual numbers due to limited availability of facilities. With the 4 machines in place, it will be possible to render the services round the clock. With increased facilities, the number of patients catered to would increase resulting in to increase in cost of treatment.

In addition to this, there is a plan to establish a separate 25 bedded nephrology wing where the patient before dialysis and after dialysis would be managed. The cost of medicines for treatment of such patients would be an additional burden on the institution and is expected to be high.

With the increased availability of funds, the hospitals would be able to render services to 200 patients (2 times a week, 104 times a year) at Rs. 1800 per patient per dialysis including medicines. This would require an allocation of Rs. 3. 75 crores.

Further, many of the renal failure patients need to be referred for renal transplantation. Each renal transplantation costs about 10-15 lakhs. Moreover, there are a few transplant cases which need special medicines costing about Rs. 15, 000 to Rs. 20, 000 per month. It

is estimated that the department would be catering to about 5-6 patients for renal transplantation and post transplantation care. For this an estimated allocation of Rs. 1 crore is required. As these patients are very susceptible to other ailments (co-morbidity), the treatment of these patients and follow up of transplanted kidney would require an additional allocation of Rs. 25 Lakhs.

Given the cost of dialysis (including admission and treatment), renal transplanting and post transplanting follow up and care would require an allocation of Rs. 5 crores.

Cancer patients

The department now has facility of early diagnosis of cancer. However, it has to depend completely upon external agencies for providing treatment facilities. Some severe cases may require patients to be referred to institutions outside the state.

As there is no facility for cancer treatment in gas relief hospitals, most of the cancer patients are being treated at Jawaharlal Nehru Cancer Hospital & Research Centre, Bhopal for which the department has to incur the actual expenditure for the specialized investigations, surgery, chemotherapy and radio therapy etc for gas victim cancer patients. Up till now payments have been made to the tune of Rs. 14.78 crores to Jawaharlal Nehru Cancer Hospital and Research Centre. At present there are about 2463 registered cancer patients. As a result of the early diagnosis facility, it is expected that more patients would be referred to external institutions, thereby, increasing the burden on resources.

Till now, due to paucity of resources, the department was unable to provide referrals to severe patients requiring referrals to outside the state. However, with the resources in hand the department would be able to refer these patients to super specialized

institutions outside the state for proper treatment. The present budget provision for cancer patients is about 3 crores. Once the referral cases are allowed to receive treatment from outside the state, the cost would increase substantially. It is estimated that annually about 20 patients would be referred out of state at the rate of Rs. 5 Lakhs per patient cost of treatment.

Therefore, a budgetary provision of Rs. 4 crore has been estimated for the cancer patients.

Congenital Malformation Cell

The department does not have any facility for congenital malformed children in any of the hospitals. The department will establish a congenital malformation registry to enumerate the number of malformed children among the gas exposed families of Bhopal. It will also create a specialized diagnostic and management facility for such children. The latest action plan has provided 6 lac for the cell. All these patients would be referred to an external agency for diagnosis and treatment which would require additional allocation of resources. Among the congenital malformed children there is a possibility of cardiac anomaly and some may also belong to the neurologically deficit group which would require higher resource allocation and long term support in terms of physiotherapy facilities for these children. The annual target of the group has been placed at 300 children per year.

Out of 300 there is a possibility of congenital malformation of heart in 2-3% children who would require surgical intervention costing about Rs. 10 Lakhs including medication. Earlier gas relief department used to refer such cases to Indrprastha Apolo Hospital, New Delhi.

There is a possibility of 2-5% children having congenital malformation related to lip and palate which would again require surgical intervention. There are other different types of anomalies which would require surgical corrections. Once the Congenital malformation cell starts functioning and registration of patient is done actual requirement can be enumerated. At present we are allocating funds at the minimum for treatment, investigation etc at Rs. 1 crore per year.

The summary of fund requirement for various kinds of medical treatment is as follows;

S. No.	Items	Fund Requirement (in Rs. crore)
1	Routine medical treatment	20
2	Specialized treatment for severely ill patients ailments	15
3	Super specialty treatment for cancer and renal patients	10
	Total	**45**

b. Hospital Equipment Replacement

The specialized nature of hospitals under the department requires replacement of dysfunctional equipments and addition of new equipments as per the requirement. The average recommended life of equipment varies between 7 and 10 years. Therefore, regular replacement becomes a necessity for their continued functional availability. A lot of equipments have already crossed their expiry date or are reaching expiry. The department has classified them as per their functioning. The latest action plan, for now, provides for replacement of equipments. However, there would be a regular requirement for resource making necessary replacements and addition of new equipments as per requirement in the future.

As per the medical audit findings equipments including Body Plethysuograph, Vitatograph, Ultrasonic Nabuloser, Glucometer, Semi- Automatic Photometer, MMR with X-ray, USG, Blood Gas analyzer, Yag Laser, Haemodialysis machine, Multipara Cardiac

Monitor, Semi Automatic Analyzer, 5- Part Blood Cell Counter, Carbon dioxide Monitor and Ventilator have qualified for immediate replacement. The same would be met through resources provided under the latest action plan. However, the future and some current needs for replacement of old equipments would require a provision of Rs. 5 crore, annually.

c. Equipment Maintenance and Consumables

It is expected that the hospitals under the department would have equipments estimated worth Rs. 45 crores. This would include new equipments and replaced equipments procured under the latest action plan for Rs. 28.22 crores and equipments already in place. This would entail an annual maintenance cost in the range of 4.25 crore per annum.

The cost of spare parts is not covered under annual maintenance contract. This cost is variable and an allocation of Rs. 75 Lakhs has been budgeted. The spare parts of some of the equipments are very costly and its timing cannot be ascertained. For others the cost is relatively low but is required on a regular basis. The average recommended life of spare part is about 7 to 10 years. For example, CT-Scan needs replacement of X-ray tube every alternate year which is costing about Rs. 25 Lakhs. Similarly, other equipments like MRI, X-ray machine, Dialysis machine etc require replacement of some part(s) at specific intervals.

In terms of consumables, a major requirement is for dialysis. At present the number of dialysis is around 700 per year. The requirement as per patient load is around 3000 dialysis per year. Therefore the total cost of dialysis would be in the range of Rs. 36 Lacs.

In addition to this, the department is carrying out about 25000 X-rays per years, 300 CT scans and 9000 ECGs, 800 Echocardiography, 11000 ultra-sonography, 150 PFT and other pathological investigations and all these investigations require disposables. At present the cost of these disposables is about Rs. 50 Lakhs. With expected increase in number of patients, the allocation has been increased to Rs. 75 Lakhs.

Given the fund requirement for maintenance, spare parts and consumables an allocation of Rs. 6 crore is absolutely necessary.

d. Computerization, Networking and Smart Card

It has become a long pending issue for the gas relief hospitals. Presently, all the hospitals are computerized in terms of OPD facilities and mainly support the registration of patients. As per the recommendation of honorable Supreme Court and advisory committee constituted by honorable Supreme Court of India all the hospital functioning under gas relief department should be fully computerized to establish HIMS. In addition to this, all the gas victims should be provided smart card to facilitate easy access to individual's medical history to ensure proper medical management of gas victim. Moreover, there is need to analyze the hospital data so that any improvisation in the treatment facilities can be operationalized quickly.

A proper HIMS would also help in tracking of individual patient across all the medical institution under the department and ensure proper usage of medicines. The system can also help distribute patients amongst the different medical institutions based on their location of residence and kind of medical facility required. This would help in optimizing patient pressure on each institution.

The department has reached the final stage of approval of computerization with a provision of a smart card for each gas victim (estimated at 5 lakhs). The estimated cost of computerization would be Rs.3 crore per hospital which would be met by GoMP. NIC has to build the network and operate it in a build- operate mode. An allocation of Rs. 5 crore has been made here which would be provided to NIC on an annual maintenance contract.

The gap of Rs. 42.5 crores in the fund allocation is expected to be filled through the interest from corpus of Rs. 500 crore requested from the GoI. GoMP intends to use the income from corpus funds to meet only the productive expenditure that directly meets the diagnostic and treatment needs of the patients and would be bearing the administrative costs pertaining to human resources and construction on their own.

However, it is also realized that the interest from the corpus might not be sufficient to cover the annual expenses required over the years. In that case, the state would manage the shortfall from its own resources.

5. Conclusion

The surviving victims of Bhopal Gas Tragedy, their dependants and dependants of those who lost their lives, make demands on the medical rehabilitation set-up for meeting their diagnosis and treatment needs. Their situation is made difficult by the strong impact of the gas which has lead to minor to severe to multiple ailments in the victims and has also affected their children.

The effort made by the state government has been to provide them with basic and advanced services throughout the past 25 years. However, the gaps in services have been realized due to want for basic investigation and treatment service for the increasing patient numbers, advanced infrastructure and funds for providing referral services.

GoMP for the past 25 years has been providing the services from primarily its own resources. A financial support was provided to the state in the form of first action plan by the GoI in 1990. After 1999, there has been no support from the center. The present request for the corpus of Rs. 500 crore from GoI would take care of the much needed recurring costs to ensure proper and continuous provision of services for the gas patients.

Bhopal Gas Tragedy Memorial Statue