Environmental Impact Assessment
of
Dhulikhel Hospital Trauma and Emergency Center, Dhulikhel Municipality, Kavrepalanchok District, Bagmati Province

Submitted To

Ministry of Forests and Environment (MoFE)

Singh Durbar, Kathmandu

Through
Ministry of Health and Population (MoHP)
Ramshahpath, Kathmandu

Submitted By
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Great Globe International Pvt. Ltd.

DHULIKHEL HOSPITAL 1996 NEPAL

March, 2023

कार्यकारी सारांश

१. प्रतिवेदन तयार गर्ने सँस्थाको नामः

१.१ प्रस्तावकः

प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर आयोजनाको प्रस्तावक धुलिखेल अस्पताल हो। प्रस्तावकको पुरा नाम र ठेगाना निम्न बमोजिम रहेको छ।

धुलिखेल अस्पताल
धुलिखेल नगरपालिका-६, काभ्रेपलाञ्चोक
फोन नः ०११-४९०४९७
ईमेलः direct@dhulikhelhospital.org
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१.२ वातावरणीय प्रभाव मूल्याङ्कन अध्ययनको औचित्यः

वातावरण संरक्षण नियमावली, २०७७ को अनुसची-२, (ख) स्वास्थ्य क्षेत्र बमोजिम २५ भन्दा बढी १०० शय्यासम्मको अस्पताल, नर्सिङ्ग होम वा चिकित्सा व्यवसाय सञ्चालन गर्न प्रारम्भिक वातावरणीय परीक्षण आवश्यक पर्ने भएता पनि वातावरण संरक्षण नियमावली, २०७७ को अनुसची-३, (ज) को खण्ड "६" अनुसार २०००० लिटर भन्दा बढी दैनिक भूमिगत पानीको प्रयोग हुने भवन निर्माण तथा सञ्चालन गर्ने प्रस्तावकले आयोजना निर्माण गर्नुपूर्व वातावरणीय प्रभाव मूल्याङ्कन प्रतिवेदन तयार गरी उक्त प्रतिवेदन स्वीकृत गराउनु पर्ने प्रावधान रहेको छ। प्रस्तावित आयोजनाले १०० शय्या क्षमताको अस्पताल निर्माण तथा सञ्चालन गर्ने भएता पनि दैनिक ४५००० लिटर भूमिगत पानीको प्रयोग गर्ने भएकोले वातावरणीय प्रभाव मूल्याङ्कन गर्नु परेको हो।

२. प्रस्तावको परिचयः

२.१ आयोजनाको विवरणः

प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर धुलिखेल अस्पतालद्वारा संचालन हुनेछ। प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर धुलिखेल नगरपालिकाको वडा नं. ६ मा १०० शय्या क्षमतामा निर्माण तथा सञ्चालन हुनेछ। प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर JICA (Japan International Cooperation Agency) को आर्थिक सहयोगमा धुलिखेल अस्पतालको मातहतमा निर्माण तथा सञ्चालन हुन लागेको हो।

प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर दक्ष जनशक्तिद्वारा सर्वसुलभ स्वास्थ्य सेवा प्रदान गर्ने उद्देश्यले निर्माण तथा सञ्चालन हुन् लागेको हो। प्रस्तावित ट्रमा सेन्टरबाट दिइने सेवाहरुमा ट्रमा एण्ड ईमर्जेन्सी मेडिकल सेवा, ट्रमा ईमर्जेन्सी बहिरङ्ग र अन्तरङ्ग सेवा, ट्रमा र ईमर्जेन्सी अपरेशन सेवा, आई.सि.यू र एच.डि.यू सेवा, रेडियोलोजी सेवा, प्रयोगशाला सेवा, रक्त परीक्षण सेवा, फिजियोथेरापी सेवा र फार्मेसी सेवा आदि रहने छन्। यस बाहेक २४ सै घण्टा

आकस्मिक ट्रमा सेवा र एम्बुलेन्स सेवा पनि प्रदान गरिनेछ। प्रस्तावित आयोजनाको कुल जग्गाको क्षेत्रफल ९४२३.४८ वर्ग मि. रहेको छ भने कुल निर्माण क्षेत्रफल ७३२७.६२७ वर्ग मि. रहेको छ। प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर सञ्चालन हुने भवन ३ तला वेसमेन्ट सहित जम्मा ५ तल्लाको हुनेछ जुन भवन भुकम्प प्रतिरोधात्मक रहनुका साथै आपतकालिन संरचनाहरु पनि जडान गरिने छन्। यसका अतिरिक्त खुल्ला क्षेत्र, बगैचा, पार्किङ्ग तथा फोहरमैला व्यवस्थापनको लागि पनि आवश्यक जग्गा छुट्याईनेछ। अस्पताल सञ्चालन पश्चात जम्मा २१० प्राविधिक र अप्राविधिक जनशक्तिले प्रत्यक्षरुपमा रोजगारी पाउने छन्। प्रस्तावित ट्रमा सेन्टर १०० शय्यामा सञ्चालन हुँदा ४५,००० लिटर प्रतिदिन पानी आवश्यक पर्नेछ भने १०० शय्याको ट्रमा अस्पताल सञ्चालन अवस्थामा करिब १७० किलोग्राम प्रतिदिन अस्पतालजन्य फोहोरमैला उत्सर्जन हुने देखिन्छ। प्रस्तावित आयोजनाको कार्यसूची र क्षेत्र निर्धारण प्रतिवेदन वन तथा वातावरण मन्त्रालयबाट मिति २०७९/०२/०९ मा स्वीकृत गरिएको थियो।

३. अध्ययन विधिः

आयोजनासँग सम्बन्धित सन्दर्भ सामाग्रीको पुनरावलोकन तथा स्थलगत अध्ययनबाट तथ्याङ्क सङ्कलन गरी यो प्रतिवेदन तयार गरिएको छ। सन्दर्भ सामाग्रीको अध्ययन अन्तर्गत आयोजनाको आर्किटेकचरल तथा स्ट्रकचरल नक्साहरु अध्ययन, माटो परीक्षण प्रतिवेदन अध्ययन, GIS/गुगल नक्साहरुको अध्ययन गरिएको थियो। यसका अतिरिक्त यस आयोजनासँग सम्बन्धित कानूनी दस्तावेज, केन्द्रीय तथ्याङ्क विभागबाट प्रकाशित तथ्याङ्कहरु पुनरावलोकन गरिएको थियो साथै चेकलिष्टको पनि तयारी गरिएको थियो। त्यसैगरी वातावरणीय अध्ययन टोलीले विद्यमान वातावरणीय अवस्थाको तथ्याङ्कहरु सङ्कलन गर्न विभिन्न विधाका विज्ञहरुको टोली बनाई मिति २०७९/०२/१४ देखि २०७९/०२/२७ सम्म स्थलगत भ्रमण गरी आवश्यक तथ्याङ्क सङ्कलन गरिएको थियो। त्यस क्रममा स्थलगत अवलोकन, स्थानीयसँग छलफल, मुख्य जानकार व्यक्तिसँग अन्तर्वार्ता, समूहगत छलफल आदि गरिएको थियो। यसरी सङ्कलन गरिएका तथ्याङ्कहरुलाई मेट्रिक्स प्रणालीद्वारा वातावरणीय प्रभावहरुको पहिचान र आकंलन गरी वातावरणीय प्रभाव मूल्याङ्कन प्रतिवेदन तयार गरिएको छ। यसैगरी वातावरण संरक्षण नियमावली, २०७७ को नियम ६ बमोजिम प्रस्ताव कार्यान्वयनबाट प्रभावित क्षेत्र धुलिखेल नगरपालिकाको सभा हलमा मिति २०७९/०२/३१ गतेका दिन स्थानीय सरोकारवाला व्यक्ति र स्थानीय तहका जनप्रतिनिधिको सहभागितामा सार्वजनिक सुनुवाई आयोजना गरी रायसुझाव सङ्कलन गरिएको थियो। सार्वजनिक सुनुवाई गर्ने प्रयोजनका लागि सार्वजनिक सुनुवाईको मिति, समय, स्थान र आयोजनाको सम्बन्धमा प्रचार प्रसार गर्नको लागि राष्ट्रिय दैनिक पत्रिका "आर्थिक अभियान" मा मिति २०७९/०२/२६ मा सूचना प्रकाशन गरिएको थियो।

४. कानूनी दस्तावेजको पुनरालोकनः

प्रस्तावित आयोजनासँग आकर्षित हुने योजना, नीति, नियम, ऐन, नियमावली, निर्देशिका, मापदण्ड तथा अन्तराष्ट्रिय सन्धिहरुको पुनरावलोकन गरी यस प्रतिवेदनमा समावेश गरिएको

छ। पुनरालोकन गरिएका मुख्य कानूनी दस्तावेजहरुमा फोहरमैला व्यवस्थापन ऐन, २०६८, श्रम ऐन, २०७४, जनस्वास्थ्य सेवा ऐन, २०७५, वातावरण संरक्षण ऐन, २०७६, फोहरमैला व्यवस्थापन नियमावली, २०७०, वातावरण संरक्षण नियमावली, २०७७, जनस्वास्थ्य सेवा नियमावली, २०७७, राष्ट्रिय वातावरण प्रभाव मूल्याङ्कन निर्देशिका, २०५०, राष्ट्रिय स्वास्थ्यजन्य फोहरमैला व्यवस्थापन मापदण्ड तथा संचालन विधि, २०७७, स्वास्थ्य संस्था सञ्चालन मापदण्ड, २०७७ आदि रहेका छन्।

५. विद्यमान वातावरणीय अवस्थाः

५.१ भौतिक वातावरणः

प्रस्तावित धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर काभ्रेपलाञ्चोक जिल्लाको धुलिखेल नगरपालिका वडा नं ६ मा अवस्थित रहने छ। प्रस्तावित आयोजना समुन्द्र सतहबाट १५५० मि. को उचाईमा अवस्थित रहेको छ। यहाँको औसत अधिकतम तापक्रम २४ डिग्री सेन्टिग्रेड रहेको छ भने न्यूनतम औसत तापक्रम १० डिग्री सेन्टिग्रेडसम्म रहेको छ। यहाँ औसत वर्षा १६०० मि. मि. हुने गरेको छ। धुलिखेल नगरपालिकाको Seismic Zoning Factor (Z)= 0.35 रहेको छ जुन सेस्मिक हिसाबले जोखिमयुक्त क्षेत्रभित्र पर्दछ। यहाँको भू-उपयोग अधिकांस सहरी क्षेत्र रहेको छ।

आयोजना क्षेत्र वरपरको वायुको गुणस्तर परीक्षण प्रतिवेदनले यस क्षेत्रको वायुको गुणस्तर वायु गुणस्तर सम्बन्धी राष्ट्रिय मापदण्ड, २०६९ को सिमा भित्र रहेको पाइएको छ। आयोजना क्षेत्रमा दिनको समयमा ध्वनिको तह ६५ डेसिवल देखिएको छ भने रातमा ६२ डेसिवल देखिएको छ। जुन शहरी आवास क्षेत्रको ध्वनिको अधिकतम सीमा भन्दा बढी रहेको छ।

५.२ जैविक वातावरणः

प्रस्तावित आयोजना स्थल शहरी क्षेत्र तथा राजमार्ग नजिक रहेको हुनाले आयोजना स्थलमा कुनै पनि प्रकारको संकटापन्न वनस्पति रहेको देखिन्दैन। आयोजना स्थलमा उतिस, काँगियो, खन्यू, लाकुरी, पिपल आदिका बोटवबिरुवाहरु रहेका छन्। त्यसै गरी आयोजना क्षेत्रमा कुनै पनि प्रकारको संकटापन्न वन्यजन्तु तथा चराचुरुङ्गी रहेको छैनन्। यस आयोजना स्थल वरपर देखिएका चराचुरुङ्गीहरुमा घर गौंथली, कालो चिबे, कल्चौडे, बस्तु बकुल्ला, मलेवा, कन्ठे ढुकुर, रुख भंगेरा, धोबिनी चरा, जुरेली, कन्ठे सुगा, फिरफिरे आदि रहेका छन्।

५.३ सामाजिक आर्थिक तथा सांस्कृतिक वातावरणः

केन्द्रीय तथ्याङ्क विभागको प्रारम्भिक विवरण, २०७८ बमोजिम धुलिखेल नगरपालिकाको कुल जनसंख्या ३६१८३ रहेको छ। जसमध्ये पुरुषको जनसंख्या १८५०१ र महिलाको जनसंख्या १७६८२ रहेको छ। त्यस्तै धुलिखेल नगरपालिका वडा नं ६ को जनसंख्या २१२५ रहेको छ जसमध्ये पुरुषको जनसंख्या १०४८ र महिलाको जनसंख्या १०७७ रहेको छ। यस क्षेत्रमा प्रमुखरुपमा नेवार जातीसँगै तामाङ, ब्राह्मण, क्षेत्री जातका मानिसहरुको बाहुल्यता रहेको छ भने

यस क्षेत्रमा हिन्दु धर्म मान्ने मानिसहरुको बाहुल्यता रहेको छ। यस क्षेत्रमा खानेपानी, विद्युत तथा सञ्चारको सुविधा उपलब्ध रहेका छन्। आयोजना स्थल नजिक भगवती मन्दिर रहेको छ।

६. वैकल्पिक विश्लेषणः

प्रस्ताव सम्बन्धमा रहने स्थान, डिजाइन, वैकल्पिक प्रविधि, समय तालिका र कार्यान्वयन, वातावरणीय व्यवस्थापन योजना, जोखिम न्यूनीकरण, योजना हुँदा वा नहुँदाको अवस्थाको विश्लेषण गरिएको छ। अहिलेको परिवेशमा यस प्रस्तावको लागि अवलम्बन गरिएका विकल्पहरु प्राविधिक,आर्थिक र वातावरणीय दृष्टिकोणबाट उत्कृष्ट देखिन्छन् ।

७. वातावरणीय प्रभावः

७.१ सकारात्मक प्रभावहरुः

आयोजना निर्माण अवधिमा ७० जना व्यक्तिलाई रोजगारीको अवसर मिल्नेछ भने सञ्चालन अवधिमा २१० जना जनशक्तिले रोजगार पाउने छन्। प्रस्तावित आयोजनाले सर्वसुलभरुपमा ट्रमा बिरामीहरुलाई स्वास्थ्य सेवा प्रदान गर्नेछ। यस बाहेक प्राविधिक सिपमा बढोत्तरी, व्यापार–व्यवसायमा वृद्धि, विपन्न, असाहाय र बेवारिसे बिरामीका लागि निःशुल्क स्वास्थ्य सेवामा पहुँच यस आयोजनाबाट पर्ने मुख्य सकारात्मक प्रभावहरु हुन्।

७.२ नकारात्मक प्रभावहरुः

प्रस्तावित आयोजना निर्माण तथा संञ्चालन अवधिमा भौतिक वातावरणमा पर्न सक्ने नकारात्मक प्रभावहरुमा निर्माण कार्यबाट उत्सर्जन हुने ठोस फोहरमैलाबाट पर्ने प्रभाव, अस्पतालजन्य फोहोरमैला उत्सर्जनबाट पर्ने प्रभाव, संक्रमित फोहरपानीबाट पर्न सक्ने प्रभाव, सतहको पानी प्रदूषण, ध्वनि तथा वायु प्रदूषणबाट पर्ने प्रभाव, अस्पतालजन्य फोहरमैला उत्सर्जन र तिनको व्यवस्थापनबाट पर्ने प्रभाव, भूमिगत पानीको स्रोतमा आउने कमीका कारण पर्ने प्रभाव, उच्च ऊर्जा खपतबाट पर्न सक्ने प्रभाव, विपद व्यवस्थापनको प्रभाव, विकिरण उत्सर्जनबाट पर्न सक्ने प्रभाव आदि रहेका छन्।

आयोजना निर्माण स्थल शहरी क्षेत्र भएको हुनाले यस क्षेत्रमा कुनै संकटापन्न वनस्पति रहेको छैन साथै निर्माण स्थलमा कुनै वनस्पति नरहेको हुनाले जैविक वातावरणमा प्रभाव पर्ने देखिदैन। आयोजना निर्माण तथा संञ्चालन अवधिमा सामाजिक आर्थिक तथा साँस्कृतिक वातावरणमा पर्ने प्रभावहरुमा पेशागत सुरक्षा तथा स्वास्थ्य, स्वास्थ्य तथा सरसफाई कमीबाट पर्ने प्रभाव, सडकमा सवारी साधनको चाप, बालश्रमको प्रयोगबाट पर्ने प्रभाव, लैंगिक विभेदबाट पर्ने प्रभाव, गुनासो सम्बोधन र व्यवस्थापन, प्रकोपबाट पर्ने प्रभाव आदि रहेका छन्।

८. सकारात्मक प्रभाव अभिवृद्धि तथा नकारात्मक प्रभाव न्यूनीकरणका उपायहरुः

८.१ सकारात्मक प्रभाव अभिवृद्धिः

आयोजना कार्यान्वयनबाट पर्न सक्ने सकारात्मक प्रभावहरुलाई अभिवृद्धि गर्नको लागि स्थानीयलाई रोजगारीमा अवसर दिईने, विपन्न, असाहाय र बेवारिसे बिरामीका लागि निःशुल्क

उपचारको व्यवस्था गरिने, ट्रमा बिरामीहरुलाई गुणस्तरीय स्वास्थ्य सेवा प्रदान गरिने, प्राविधिक सीपको बढोत्तरी गरिने, स्वास्थ्य सम्बन्धी तालिम प्रदान गरिने आदि जस्ता उपायहरु अविलम्बन गरिने छन् । सकारात्मक प्रभावहरु अभिवृद्धि गर्नको लागि ने. रु. १०,००,०००/- (दश लाख मात्र) प्रस्ताव गरिएको छ।

८.२ नकारात्मक प्रभाव न्यूनीकरणः

आयोजनाले भौतिक वातावरणमा पर्ने प्रभावको न्यूनीकरण गर्न अस्पतालजन्य फोहरमैला व्यवस्थापनका लागि कलर कोडिङ सिस्टम मार्फत फोहरमैला वर्गीकरण गरी फोहरमैलालाई पुनःप्रयोग तथा पुनःचक्रिय गर्न मिल्ने किसिमले छुट्याईनेछ, मानव अङ्ग तथा तन्तु व्यवस्थापनको लागि बायोपिटको प्रयोग गरिनेछ, संक्रमित फोहरलाई अटोक्लेभिङ मार्फत संक्रमित रहित पारिनेछ। त्यस्तै संक्रमित पानी प्रशोधन गरेर मात्र ढलमा मिसाईनेछ, भुकम्प प्रतिरोधि भवन निर्माण गरिनेछ, अस्पताल क्षेत्रलाई मर्करी फ्रि गरिनेछ, आकाशे पानी सङ्कलन गर्ने प्रविधिको प्रयोग गरिनेछ, भूमिगत पानी पुनः भरण गर्न रिचार्ज पिटको निर्माण गरिनेछ, अपाङ्गमैत्री संरचना निर्माण गरिनेछ, आगलागि नियन्त्रणको लागि अग्नि नियन्त्रक यन्त्र जस्तैः फायर हाइड्रेन्ट, फायर इक्सिङ्ग्युसर तथा पानीको संचय गरिनेछ। सवारी साधन समय-समयमा मर्मत गर्नुका साथै वैकल्पिक ऊर्जाको लागि सोलार जडान गरी वातावरणीय प्रदूषण कम गरिनेछ ।

प्रस्तावित आयोजनाका कारण सामाजिक-आर्थिक वातावरणमा पर्ने प्रभावको न्यूनीकरणको लागि विभिन्न उपायहरु अपनाइने छन् जस अन्तर्गत पेशागत स्वास्थ्य तथा सुरक्षामा पर्ने प्रभाव न्यूनीकरण गर्न सुरक्षाका उपकरणहरु प्रदान गरिनेछ, बालश्रमको प्रयोगमा निषेध गरिनेछ, सडकमा पर्न सक्ने चाप कम गर्न पार्किङ्गको व्यवस्था गरिनेछ, विपद व्यवस्थापनको लागि आपतकालिन द्वारहरुको व्यवस्था गरिनेछ र साथै अग्नि नियन्त्रक यन्त्र प्रयोग गरिनेछ, गुनासो सुनुवाईको लागि गुनासो सुनुवाई सेल रहने छ।

नकारात्मक प्रभावहरु न्यूनीकरण गर्नको लागि ने.रु. ६८,००,०००/- (अठसट्टी लाख मात्र) प्रस्ताव गरिएको छ।

८.३ वातावरणीय व्यवस्थापन योजना

वातावरणीय व्यवस्थापन योजना सकारात्मक वातावरणीय प्रभाव अभिवृद्धि तथा नकारात्मक प्रभाव न्यूनीकरणको कार्यान्वयनका लागि तयार गरिएको छ। वातावरणीय व्यवस्थापन योजना कार्यान्वयन गर्नका निम्ति प्रस्तावक प्रतिवद्ध रहेको छ र यसको लागि छुट्टै वातावरणीय एकाई स्थापना गरिनेछ।

९. वातावरणीय अनुगमन योजना

प्रस्तावकले प्रस्तावको निर्माण तथा सञ्चालन गर्ने चरणमा सोबाट वातावरणमा परेको प्रभावको विषयमा प्रत्येक छ महिनामा स्वःअनुगमन गरी सोको प्रतिवेदन सम्बन्धित निकाय वा विभागमा पेश गर्नेछ। वातावरणीय अनुगमनको लागि वन तथा वातावरण, स्वास्थ्य तथा जनसंख्या मन्त्रालय

तथा वातावरण विभागसँग समन्वय गरिनेछ। वातावरणीय अनुगमनको लागि ने. रु. ५८,४२,०००/-(अन्ठाउन्न लाख बयालीस हजार मात्र) प्रस्ताव गरिएको छ ।

१०. वातावरणीय परीक्षणः

मन्त्रालय वा तोकिएको निकायले प्रस्तावको कार्यान्वयन सुरु गरी सेवा वा वस्तु उत्पादन वा वितरण सुरु गरेको दुई वर्ष भुक्तान भएको मितिले छ महिना भित्र वातावरणीय परीक्षण कार्य गर्नेछ। प्रस्तावक आफैले पनि वातावरणीय परीक्षण कार्य गर्नेछ।

११. निष्कर्षः

धुलिखेल हस्पिटल ट्रमा एण्ड ईमर्जेन्सी सेन्टर सञ्चालनले ट्रमा स्वास्थ्य सेवाको विस्तार भई स्तरीय स्वास्थ्य सेवामा विकास तथा उपलब्धता हुने देखिन्छ। यस ट्रमा सेन्टर सञ्चालनबाट ट्रमा बिरामीहरुलाई दक्ष जनशक्तिद्धारा सर्वसुलभ स्वास्थ्य सेवा प्रदान गरिनेछ। यसका अतिरिक्त आयोजना सञ्चालनबाट केही अल्पकालीन तथा दीर्घकालीन प्रभावहरु पनि पर्ने देखिन्छन्। अल्पकालीन प्रभावहरु आयोजनाको निर्माण अवधिमा सिमित हने छन् भने दीर्घकालीन प्रभावहरु जस्तैः अस्पतालजन्य फोहरमैला उत्सर्जन, संक्रमित पानी उत्सर्जन, विकिरण उत्सर्जन, ध्वनि प्रदूषण, पार्किङ्ग व्यवस्थापन, आगलागी दुर्घटना, पेशागत स्वास्थ्य तथा सुरक्षा, सामाजिक गुनासो आदि दीर्घकालीनरुपमा रहने छन् जसलाई विभिन्न न्यूनीकरणका उपायहरुद्वारा न्यूनीकरण गरिनेछ। प्रस्तावक वातावरणी प्रभाव न्यूनीकरणका उपायहरु, वातावरणीय व्यवस्थापन योजना तथा वातावरणीय अनुगमन योजना कार्यान्वयन गर्न प्रतिवद्ध रहेको छ।

EXECUTIVE SUMMARY

1. Name of Institution preparing report

1.1 Proponent

The proponent of the proposed Dhulikhel Hospital Trauma and Emergency Centre is Dhulikhel Hospital. The name and address of the proponent is given below.

Dhulikhel Hospital
Dhulikhel Muncipality-6, Kavrepalanchok
Contact No.: 011-490497
Email:direct@dhulikhelhospital.org
Contact Person: Rajaram Parajuli

1.2 Rationality for EIA Study

According to Schedule 2 of Environment Protection Rules, 2077, there is a provision to conduct an initial environmental examination for the construction and operation of a hospital, nursing home or medical business with more than 25 up to 100 beds but according to EPR 2077, Schedule 3 "ज" (6) there is a provision to conduct Environmental Impact Assessment for the construction and operation of a building that will use more than 20,000 liters of groundwater daily. The proposed project will have 100 beds capacity but will consume 45,000 liters of groundwater daily, so an EIA study has been conducted.

2. Introduction of Proposal

2.1 Project Description

Dhulikhel Hospital Trauma and Emergency Centre is an integral part of the Dhulikhel hospital, which will run as a separate department of the Dhulikhel Hospital. The proposed Dhulikhel Hospital Trauma and Emergency Centre is being constructed and operated in Ward No. 6 of Dhulikhel Municipality with a capacity of 100 beds. Dhulikhel Hospital Trauma and Emergency Centre is being constructed and operated under Dhulikhel Hospital with the financial support from JICA (Japan International Cooperation Agency).

Dhulikhel Hospital Trauma and Emergency Centre is operated with the goal of providing quality health services to Nepalese people from qualified human resources. Dhulikhel Hospital Trauma and Emergency Centre will provide Trauma and emergency medical care, Trauma and Emergency inpatient and outpatient services, Trauma and Emergency Operation, ICU and HDU, Radiology services, Laboratory services, Blood transfusion, Physiotherapy, Pharmacy, 24-hour emergency services and Ambulance service etc. The total land area of the proposed project is 9423.48 m^2 and the built-up area of the proposed trauma building is 7327.627 m^2. Dhulikhel Hospital Trauma and Emergency Centre building will have 5- storeys, including 3 storeys basements and 2 floor. The proposed building will be earthquake resistant building, having emergency structures. Besides this, land will be allocated for open space, gardening, parking and waste management. In total, 210 technical and non-technical human resources will be employed during the operation of

the trauma centre. About 45000 liters of ground water will be required per day during operating of 100 beds trauma hospital, and 170 kg of health care waste will be generated per day during operation of hospital. The SD/ToR report was approved on 2079/02/09 from the Ministry of Forests and Environment.

3. Study Methodology

The EIA report was prepared by analysis of collected data through the literature review related to this project, and data collected during the field study. Before conducting field study, architectural and structural drawings, soil test report, legal documents of the project, topo maps of the project site, Central Bureau of statistics published report were reviewed. Besides, this field study was carried out from 2079/02/14 to 2079/02/29. During the field study direct observation, measurement of air and noise, water sample collection, public consultation, key informant's interviews, etc., were conducted. A matrix method was used to identify and evaluate the collected data for the preparation of the Environmental Impact Assessment report. The public hearing program was organized on 2079/02/31 according to Rule 6 of Environment Protection Rules, 2077 in project-affected area, i.e. Dhulikhel Municipality's conference hall, with the presence of local stakeholders and local level representatives to collect the views and opinions of stakeholders. The notice about the public hearing was published in "Aarthik Abhiyan." on 2079/02/26, mentioning the date, time and venue.

4. Review of relevant Legal documents

The main relevant document reviewed during the preparation of the Environmental Impact Assessment report of this project are Solid Waste Management Act, 2068, Labor Act, 2074, Public Health Service Act, 2075, Environment Protection Act 2076, Solid Waste Management Rules, 2070, Environment Protection Rules 2077, Public Health Service Regulations, 2077, National Environmental Impact Assessment Guidelines 2050, Health Institution Operating Standard, 2077, National Health Care Waste Management Standards and Operating Procedures, 2077 etc.

5. Existing Environmental Condition:

5.1 Physical Environment:

The proposed Dhulikhel Hospital Trauma and Emergency Centre is situated in ward No. 6 of Dhulikhel Municipality of Kavrepalanchowk District. The proposed project will locate at an altitude of 1550 m amsl. The maximum average temperature of the project area is 24°C, and the average minimum temperature is 10°C. The value of the Seismic Zoning Factor (Z) of Dhulikhel Municipality is 0.35 which means the municipality is at high risk in term of earthquake. The air quality test report of the different sites near the project area shows that the air quality parameters are within the range of the National Ambient Air Quality Standard, 2069. The noise level recorded at the proposed project site at day time is 65 dBA, and at nighttime is 62 dBA which is beyond National Noise Quality Standard, 2069 (Urban Area).

5.2 Biological Environment:

The project site is located nearby the BP highway and urban area, so no any endemic or endangered floral species were observed in its territory; however, *Alnus nepalensis, Graviella robusta, Fraxinus floribunda, Ficus semicordata* tress are present nearby project area. Beside this no any endangered species of wild animals and birds were reported from project site during field visit. The bird species reported from project area are *Hirundo rustica, Dicrurus macrocercus, Myophonus caeruleus, Bubulcus ibis, Columba livia, Streptopelia decaocto, Passer montanus, Copsychus saularis, Pycnonotus cafer, Alexandrinus krameri, Cisticola juncidis etc.*

5.3 Socio-economic and Cultural Environment

According to CBS, 2021, the total population of Dhulikhel Municipality is 36,183 (male 18,501 and female 17,682). The total population of ward number 06 of Dhulikhel Municipality is 2125 (male 1048 and female 1077). Newar is the dominant caste of project area followed by Tamang, Brahmin-Hill, Chhetree etc. Hindu is the dominant religion followed by project affected people. Beside this, drinking water facility, electricity and communication facility are also available in project area. Bhagwati Temple is located nearby the project area.

6. Alternative Analysis

The alternative analysis of the proposal has been made with respect to location, layout/design, technological alternatives, schedule and operational procedures, environmental management system, risk analysis and no project alternative. The alternatives adopted for this proposal seem to be the best alternatives in terms of technological, economic and environmental perspectives for the current situation.

7. Environmental Impacts

7.1 Beneficial Impacts

The main beneficial impact due to the operation of project are related with employment opportunity for 70 human resources during the construction phase and 210 human resources during the operation phase, quality health services for trauma patients and discount facilities for poor and marginalized people. Apart from this, trauma related training and free health camp, business promotion and enhancement of commercial activities are the other beneficial impacts due to the operation of the proposed trauma center.

7.2 Adverse Impacts

The main adverse impacts on the physical environment during construction and operation of the project are related to solid waste generation due to construction activities, hospital waste generation, contaminated liquid waste generation, surface water pollution, noise and air pollution, depletion of water level due to over extraction of ground water, high energy consumption, natural hazards, radiation hazard etc.

The project site is located in an urban area, and there are no endangered flora and fauna present in the project site, so the biological impact will not be significant.

The adverse impacts on the socio-economic and cultural environment during construction and operation of the project are related to occupational health and safety, impact due to lack of health and sanitation, impact due to pressure on the public road, impact due to use of child labor, impact due to gender discrimination, grievance redress management etc.

8. Beneficial Impacts Augmentation measures and Adverse Impact Mitigation Measures

8.1 Beneficial Impacts Enhancement Measures

The beneficial impact due to the implementation of the project will be enhanced by various enhancement measures like priority will be given to the local people on the job, free health services to the poor and marginalized group, conduction of trauma related training and free health camp etc. An amount of NPR 10, 00,000/- (Ten lakh only) is allocated for benefit augmentation measures.

8.2 Adverse Impact Mitigation Measures

To minimize the impact on the physical environment, the trauma centre will segregate the health waste through color coding system and managed according to nature of waste. Infectious waste will be disinfected through autoclaving. Wastewater will be treated by reed bed system, which is already adopted in Dhulikhel Hospital. Earthquake resistant hospital building will be constructed. The proposed hospital area will be mercury free. Similarly, rainwater-harvesting technology will be adopted. In addition, a recharge pit will be constructed to replenish ground water. Handicap friendly structure will be constructed. Environmental pollution will be reduced by connecting solar as an alternative energy.

The main mitigation measures that will be adopted for socio- economic and cultural impact are: occupational health safety measures will be provided, child labor will be prohibited, sufficient parking area will be allocated to reduce pressure in traffic on roads, emergency exit, fire extinguisher, fire hydrant, fire tank and ramp will be installed for emergency preparedness, grievance redress unit will be established to resolve the grievance.

An amount of NPR 68, 00,000/- (Sixty Eight Lakh Only) is allocated for adverse impact mitigation measures.

8.3 Environmental Management Plan

Environmental management plan has prepared for implementation of beneficial impact enhancement measures and adverse impact mitigation measures. The proponent is committed for implementation of environmental management plan. For this, environmental management unit under project management unit will be established.

9. Environmental Monitoring Plan

The proponent will conduct self-monitoring of proposal at every 6 month during construction and operation phase to identify the impact on environment and report will submit to concerned agency and department. The project will coordinate with Ministry of Forests and Environment, Ministry of Health and Population and Department of Environment for

environmental monitoring. An amount of NPR 58, 42,000/- (Fifty eight lakh, fourty two thousand only/-) is allocated for environmental monitoring activities.

10. Environmental Auditing

The Ministry or prescribed body will conduct environmental auditing within 6 months after completion of 2 years of the commencement of service. The proponent itself will also conduct internal environmental auditing.

11. Conclusion

The EIA concludes that the construction and operation of the proposed Dhulikhel Hospital Trauma and Emergency Centre will have both beneficial and adverse impacts. The beneficial impacts are mainly related with job opportunities, skill enhancement, increase in economic activities, access to trauma health services etc. However there are some significant adverse impacts too which are related with medical waste generation, wastewater generation, dust pollution, noise pollution, occupational health and safety, radiation hazards etc. which will be mitigated by different mitigation measures. The project proponent is committed to implement all mitigation measures, environmental management plan and environmental monitoring plan.

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ABBREVIATIONS

BOD	Biological Oxygen Demand
CBS	Central Bureau of Statistics
CO	Carbon Monoxide
DUDBC	Department of Urban Development & Building Construction
EIA	Environmental Impact Assessment
EMU	Environment Management Unit
EPA	Environment Protection Act
EPM	Environment Protection Measures
EPR	Environment Protection Rules
EMP	Environmental Management Plan
GDP	Gross Domestic Product
GIS	Geographical Information System
GoN	Government of Nepal
HDU	High Dependency Unit
ICU	Intensive Care Unit
IPD	In-Patient Department
JICA	Japan International Cooperation Agency
MoHP	Ministry of Health and Population
NBC	National Building Code
NCD	Non-Communicable Diseases
NHP	National Health Policy
NHSS	Nepal Health Sector Strategy
OPD	Out Patient Department
PGA	Peak Ground Acceleration
IEE	Initial Environmental Examination
ToR	Terms of Reference
TSS	Total Suspended Solid
UNDP	United Nation Development Programme
WHO	World Health Organization

CHAPTER 1 : NAME AND ADDRESS OF THE INDIVIDUAL OR INSTITUTION PREPARING THE REPORT

1.1 Name and Address of the Proponent

The proponent of the Dhulikhel Hospital Trauma and Emergency Centre is Dhulikhel Hospital. The name and address of the proponent is as follows,

Dhulikhel Hospital
Dhulikhel Municipality-6, Kavrepalanchok
Contact No.: 011-490497
Email: direct@dhulikhelhospital.org
Contact Person: Rajaram Parajuli

1.2 Name and Address of Consultancy Preparing Report

The name and address of the consultancy preparing EIA report is as follows;

Name and Address of the Consultant

Green Globe International Pvt. Ltd.
Koteshwor, Kathmandu, Nepal
Phone No.: 01-5149111
Email: info.greenglobes@gmail.com

The following team member has been involved for the preparation of EIA report.

Table 1-1: Study team involved for preparation of the EIA report

Name/Position in EIA Study Team	Qualification	Area(s) of study in EIA	Work Experiences
Surendra Dev Bhatta/ Team Leader	M.Sc. (Environmental Science), M.A. (Political Science)	Team Leader	13 EIA report
Matrika Prasad Joshi/ Team Member	M.Sc. (Environmental Science)	Physical Environment	11 EIA report
Jay Raj Mishra/ Team Member	M.Sc. (Forestry)	Biological Environment	12 EIA report
Hikmat Bahadur Chand/ Team Member	M.A. (Sociology)	Socio-economic and cultural Environment	8 EIA report
Hem Raj Joshi/ Team Member	M.PH.	Public Health Section	4 EIA report
Gita Kusi/ Team Member	M Sc. (Environmental Science)	Waste Management Section	5 EIA report
Harendra Raj Kalauni/ Team Member	B.E. (Civil), M Sc. (Geo technical Engineering)	Engineering Section	3 EIA report

1.3 Rationality for conducting EIA Study

According to Schedule 2 (ख)-of Environment Protection Rules, 2077, there is a provision to conduct an Initial Environmental Examination (IEE) study for the construction and operation of the hospital, nursing home, or medical business more than 25 and up to 100 beds. Nevertheless, according to EPR 2077, Schedule 3 "ज" (६), there is a provision to conduct an Environmental Impact Assessment (EIA) study for the construction and operation of a building that will use more than 20,000 liters of ground water daily. The proposed project will have 100 beds capacity but will use more than 45,000 liters of groundwater per day, so this EIA study has been conducted. This EIA has conducted for sustainable operation of project. The hospital will be operated after approval of drawings from concerned Municipality and get permission from Ministry of Health and Population.

1.4 Objectives of EIA

The main objectives of EIA are:

- To identify and document the baseline data of the physical, biological, socio-economic, and cultural environments
- To analyze the data and determine the potential adverse and beneficial impacts in terms of magnitude, extent, and duration
- To prepare mitigation, monitoring, auditing, and environmental management plans
- To provide a platform for the public to raise their issues about the implementation of the project
- To advise decision-makers regarding the implementation of the project

1.5 Relevancy of the Proposal

Dhulikhel Hospital is also a regional hub medical institution and one of the largest tertiary hospitals in Nepal, receiving patients from 21 districts in the coverage area. When the Nepal Earthquake occurred in 2015, the hospital accepted patients immediately after the quake and served as a hub for disaster medical care. Since the hospital is located near the intersection of Sindhuli and Arniko roads, a major point of transportation, it receives many emergency trauma patients, including those injured in road accidents (21,665 in 2021). The hospital has shortage of equipment and beds due to the rapid increase in emergency stroke and heart disease patients because of the spread of non-communicable diseases (hereafter referred to as "NCDs") caused by dietary changes and urbanization associated with economic development. With the number of trauma and emergency patients on the rise, the hospital is expected to strengthen the capacity to cope with cases, including an increase in its equipment and beds. The hospital also serves as a teaching hospital of Kathmandu University and trains a wide range of medical professionals, including doctors, nurses, and physical therapists. The hospital is critical as a medical education institution and the only university in the county that has a bachelor's course for physical therapists.

Concerning measures against COVID-19, Dhulikhel Hospital has been designated as one of the five highest level (Level 3) hospitals and is expected to strengthen its capacity to cope

with severe cases of COVID-19."The Project for Building Trauma and Emergency Center at Dhulikhel Hospital "(hereinafter referred to as "the Project") is a high-priority project in the field of health and medical services in Nepal. This project aims to develop facilities and provide medical equipment to strengthen the regional medical services by constructing the Trauma and Emergency Center.

CHAPTER 2 : INTRODUCTION OF THE PROPOSAL

Dhulikhel Hospital is an independent, nonprofit, non-governmental institution conceived and supported by the Dhulikhel community as a quality health services provider. The late king HM Birendra Bir Bikram Shah Dev inaugurated the hospital in 1996 as a collaborative project of the Municipality of Dhulikhel, Nepali Med International, and Dhulikhel Health Service Association. The hospital is guided by the principles of social equity, sustainable development, and harmony with nature. It provides cost-effective, compassionate, and quality health care services through its trained staff. The hospital believes that quality health services need not always be an expensive commodity and limited only to those who are rich enough to afford them.

Dhulikhel Hospital is located at Dhulikhel Municipality, headquarter of the Kavrepalanchowk district. The total population of Kavrepalanchowk district is 3, 66,879 whereas the total population of Dhulikhel Municipality is 36,183. Dhulikhel is situated at an altitude of 1650 meters above sea level and 30 Km Northeast of Kathmandu, the capital city of Nepal. Dhulikhel is famous for its breath taking scenic beauty and pleasant climate. The hospital covers approximately 1.9 million people from Kavrepalanchowk, Sindhupalchowk, Dolakha, Sindhuli, Ramechhap, Bhaktapur, and other surrounding districts. Nevertheless, Dhulikhel Hospital has already provided services to people from more than 50 out of 77 districts of the country. Dhulikhel Hospital is also the university hospital for all the medical programs run in collaboration with Kathmandu University (constituent medical programs of Kathmandu University).

Dhulikhel hospital is one of the fastest growing health service provider in the country and expand its services to incorporate community development, academic excellence, research advancement and international collaborations. The hospital has become a model of sustainable quality health care in the country. The hospital is providing health care facilities with a nominal fee. In addition, patients who are not able to pay even these nominal fees are never denied treatment. Thus Dhulikhel Hospital along with its rural outreach health centers stand now as the beacon of hope for those in seek of health services for almost about 2.5 million catchment population.

2.1 Background

The Constitution of Nepal recognizes that every citizen shall have the right to free essential health services from the state, and no one shall be deprived of emergency health services. Similarly, every person shall have the right to obtain information about their medical treatment and equal access to health services. Article 3 (30) of the constitution states that each person shall have the right to live in a healthy and clean environment.

The federal Democratic Republic of Nepal (hereafter referred to as "Nepal") is one of the poorest countries in the South Asia region, and the country ranks 149th out of 189 countries in the Human Development Index (UNDP, 2018). In the National Health Care Policy (2019), the government of Nepal (hereinafter referred to as "GoN") has set the medium and

long-term policy goal of "provision of quality medical services to all citizens from basic to advanced health care." To achieve this goal, GoN is dealing with issues through the implementation of the Nepal Health Sector Strategy (NHSS) (2015/16 to 2020/21 period), which identifies specific actions to be taken. One of the critical strategies of the NHSS is to strengthen preparedness for public health emergencies and disasters, including emergency medical services. With the increase in vehicular traffic, the number of road accidents increased by approximately 3.5 times to 14,000 per year between 2000 and 2012; trauma accounted for 10% of the cause of death (the global average is approximately 6%). The number of accidents is particularly high in Nepal's central and eastern regions.

Dhulikhel Hospital is also a regional hub medical institution and one of the largest tertiary hospitals in Nepal, receiving patients from 21 districts in the coverage area. When the Nepal Earthquake occurred in 2015, the hospital accepted patients immediately after the quake and served as a hub for disaster medical care. Since the hospital is located near the intersection of Sindhuli and Arniko roads, a major point of transportation, it receives many emergency trauma patients, including those injured in road accidents (21,665 in 2021). The hospital has shortage of equipment and beds due to the rapid increase in emergency stroke and heart disease patients because of the spread of Non-Communicable Diseases (hereinafter referred to as "NCDs") caused by dietary changes and urbanization associated with economic development. With the number of trauma and emergency patients on the rise, the hospital is expected to strengthen the capacity to cope with cases, including an increase in its equipment and beds. The hospital also serves as a teaching hospital of Kathmandu University and trains a wide range of medical professionals, including doctors, nurses, and physical therapists. The hospital is critical as a medical education institution and the only university in the county, which has bachelor's course for physical therapists.

Japan's Country Assistance Policy for Nepal (September 2016) set "poverty reduction and improvement of quality of life" as a priority area and "improvement of education and health services" as a development goal. In addition, the JICA Country Analysis Paper for Nepal (June 2020) stated that JICA would address "poverty reduction and improvement of quality of life" and improve health and medical services through the development of tertiary medical facilities. The project is in line with these policies and analyses.

The project is consistent with Nepal's development goal, policies, and the cooperation policy of Japan and JICA. The project will contribute to the improvement of health care service quality in Nepal through the construction of facilities and the provision of medical equipment to address the increasing number of stroke and heart disease patients due to the spread of NCDs, as well as the rapidly increasing number of trauma patients due to the increase in traffic accidents. In addition, the project is expected to contribute to SDG Goal 3 (to ensure healthy lives and promote the welfare of all people of all ages). Therefore, there is a strong need to support the implementation of the project.

2.2 Project Description

2.2.1 Project location and Accessibility

The proposed hospital project is located at ward no.6 of Dhulikhel Municipality of Bagmati Province. The proposed hospital is located at an altitude of 1550 m from average mean sea level and 30 km from Kathmandu.

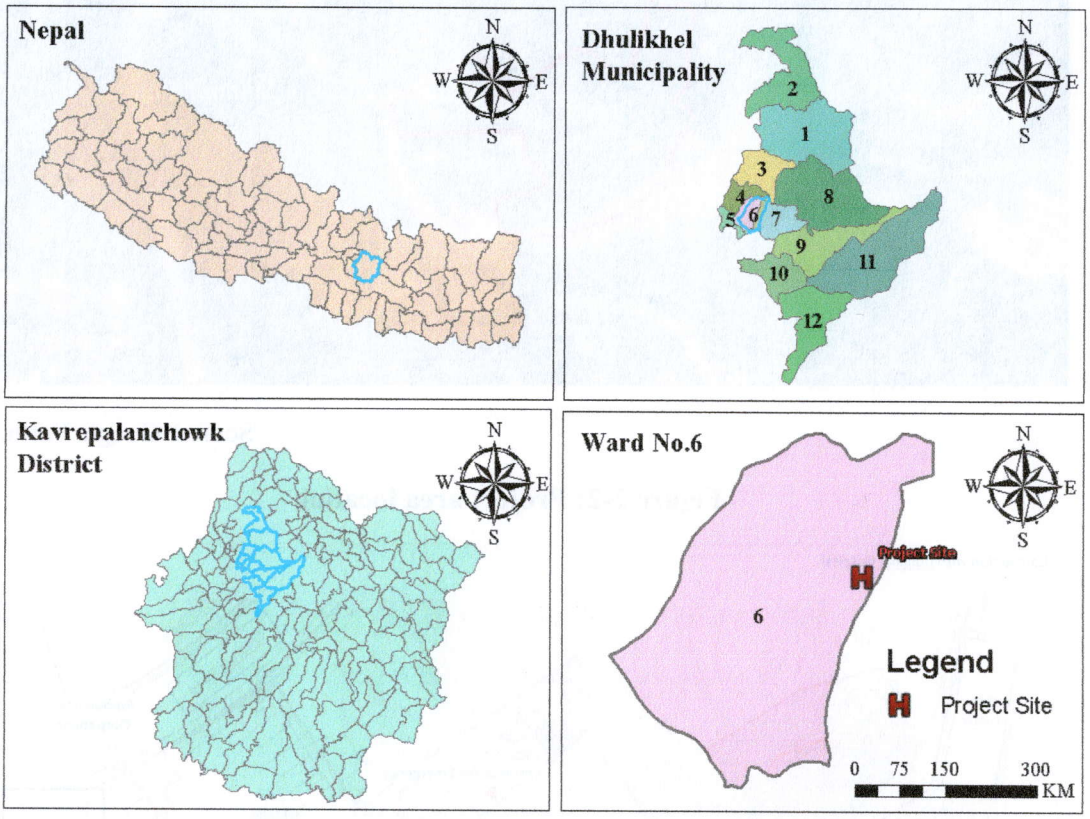
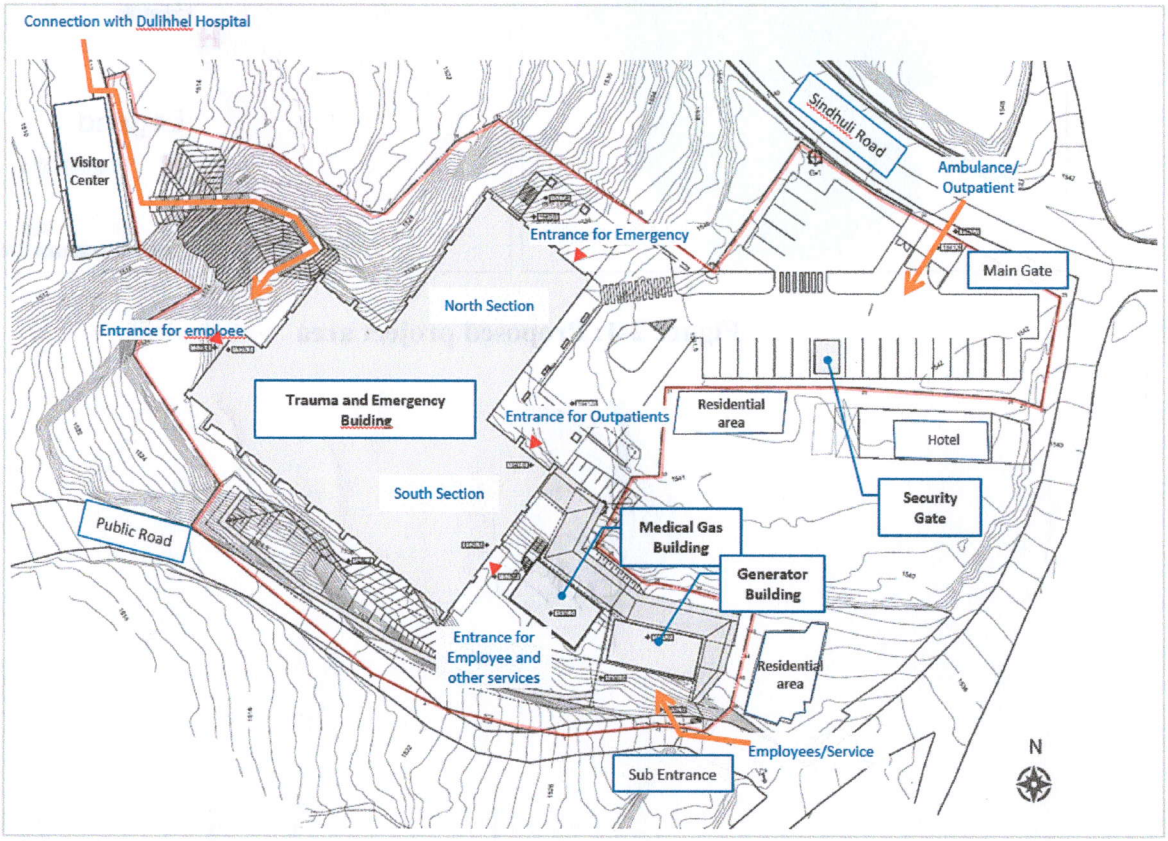


Figure 2-1: Proposed project area

Source: Google Earth,2022

Figure 2-2: Project area location



Source: JICA study Team, 2022

Figure 2-3: Facilities Layout and Project Affected Area (as of June 2022)

2.2.2 Salient Features

The salient feature of the proposed project is given in Table 2-1.

Table 2-1: Salient features of the project

Features	Specification
Name of the Project	Dhulikhel Hospital Trauma and Emergency Center
Project Location Province District Municipality Ward No. Latitude: Longitude: Altitude	 Bagmati Kavrepalanchowk Dhulikhel Municipality 6 27° 36' 58.13"N 85° 32' 59.90"E 1550 m
Hospital Type	Trauma and Emergency Center
Legal Aspects of Hospital	PAN: 303543123
No. of Beds	100
Outdoor Patients/Day Indoor Patients/Day Bed Occupancy / Day (Average)	70 60 85-90 %
Total Land area	Total land area-9423.48 Sq.m. Dhulikhel hospital-963.74 Sq.m. Ministry of Industry (Lease land)-8459.74 Sq.m.
Land Ownership Land-Plot No.	Dhulikhel Hospital (230, 1427) and lease land (Ministry of Industry-231, 237, 246, 253, 254, 256, 257, 258, 262, 263, 264, 265, 266, 269, 270, 272, 332, 373, 374, 386, 505, 554, 602)
Numbers of Floor	5 • Ground 2 floors and basement 3 floors: 5 floors • Land fill and cutting land volume is less than 20,000 m^3
Total Built up area	7327.627 Sq.m.
Third Basement floor Plan	**1,093.865 Sq.m. (Admin Research and Education / Service)** (Director, Secretary, WC, admin office, Officer office, Training equipment, PS, Conference hall, cafeteria, R&E Office, Library, Department Office 1, Department Office 2, Department Office 3, Female Changing, Male Changing, Police, IT/server, Ambulance Driver, Mortuary, Janitor, Changing, General waste storage, Medical waste storage, Disaster Management Storage, Fire Pump, Linen (Clean), Linen (Dirty), Kitchen
Second basement floor Plan	**1,203.999 Sq. m. (Physiotherapy Rehabilitation, OPD, and Laboratory, Pharmacy)** Staff, Counter, Physiotherapy Rehabilitation, Storage, Treatment recovery, Consultation 1, Consultation 2, Consultation 3, Reception, PS, Waiting, Blood Bank, Sample Collection, Pathology, Pathology Office, Hematology, Microbiology, Biochemistry, Pharmacy
First basement floor Plan	**1,777.093 Sq.m. (ICU/HDU, Operation Theater, CSSD)**

	Staff station, Isolation 1, Isolation 2, Isolation 3, PS, Sluice, Anteroom, Storage, ICU, PWD WC, Drying, Washing, Packing, Sterilization, Female Changing room, Male Changing room, Anesthesia, OT-1, OT-2 Storage preparation, Radiology, S-WC, EPS
Ground floor	**1,915.944 Sq.m. (Radiology, Emergency)** Observation (11 Beds), PWD WC, SS, PS, MRI, Anteroom, CT, storage, USG, Reception, Isolation, Green (10 beds) yellow(6 beds), EPS, Plaster Procedure, Waiting, Red (4 Beds), Staff station, Pre-hospital care/ communication, Storage, Store, Sluice, Changing, Triage, Storage/recovery, ER-OT, Emergency
First floor	**1,208.726 Sq. m. (Inpatient ward-46 beds)** Staff Station, Drug Preparation, Counseling In-charge, linen, EPS, Sluice, Treatment, Canopy, PS
Top Floor and Roof Floor Plan	**128 Sq.m.** (Electrical, Roof)
Height of Hospital Building	25 m
Main Building Coverage	1660.974 Sq.m.
Generator Room	66.818 Sq.m
Medical Gas Room	74.885 Sq.m.
Guard House	16.973 Sq.m.
Percentage of Ground Coverage	30.42 %
Open space	69.58 %
Greenery Area	1760 m^2 (20 % of Total land area)
FAR	Permissible = 1.5 Actual=1.12
Set back	25 m from the centerline of the front highway (North East side), 5 m from the centerline of drainage line (South West side), 1.5 m from Boundary
Parking area	2200 m^2 (open), Two Wheels (110), Four Wheels (40)
Disable Friendly Structure	Ramp, Lift, Wheelchair etc.
Total Hospital Blocks	1
• Health Care Waste generation per person/per day • Hospital with 100 beds generate • Hazardous waste	1.7 kg (Source : MoH ,2003) 170 Kg 44.2 Kg
Per day water consumption • Drinking water consumption • Water consumption for (Bathing, Laundry, Cleaning) purposes	45,000 ltrs. 25,000 litrs/day 20,000 litrs/day
Waste water generation per day	34,000 ltr.
Waste water management and capacity	Reed Bed System (Current waste management unit of Dhulikhel Hospital), 125,000 ltr.
Water Source	Ground water, Municipality Supply, Private Tanker
Electricity Source	NEA Transmission Line and Generators

	(Dhulikhel Hospital Dedicated 11kV Feeder)	
Fuel Consumption/month	80 L/Month (Diesel Oil)	
Generator	2 (125 kVA)	
Corporate Social Responsibility	• Free Health Camp • Discount in treatment fee for Poor and senior citizen people • Blood Donation • Donation in Local and social development program	
Facilities	Emergency treatment room, outpatient room, ward, laboratory, radiology department, operation room, ICU etc.	
Other Available Facilities	The center will have a facility for medical gas (Oxygen and Nitrogen).	
Culturally Sensitive Areas	There are not any registered culturally sensitive areas.	
Ecologically Sensitive Area	There are not any registered ecologically sensitive areas.	
Equipment in the Trauma center	MRI, CT scan, digital X-ray apparatus, defibrillator, ventilator, complete set of surgical equipment, blood testing equipment, autoclave, power generation equipment, emergency power supply	
Services provided by Dhulikhel Hospital	Anesthesiology and Critical Care, Clinical Biochemistry, Dermatology services, Emergency services, Microbiology, Obstetrics and Gynecology, Ophthalmology, Orthopedics and Traumatology, Pathology, Pediatrics, Physiotherapy, Psychiatry, Surgery etc.	
Dhulikhel Hospital Referral Hospital	TU Teaching Hospital, Bir Hospital	
Dhulikhel Hospital which cannot treat Diseases	Cancer and Diseases related with Neurology	
	2021 A.D.	**Target Value (After 3 years)**
Number of Outpatient visit Dhulikhel Hospital for Trauma and Emergency	21665	31000
In-Patient for Trauma and Emergency	2847	4000
Number of CT Examination	6987	10000
Number of MRI Examination	3627	5000
Clinical Training for Trauma and Emergency	164	170

Source: Dhulikhel Hospital Trauma and Emergency Center, 2021

2.2.3 Hospital Services

The main health services that will be provided by Dhulikhel Hospital Trauma and Emergency Center is given in Table 2-2.

Table 2-2: Health services provided by Dhulikhel Hospital Trauma and Emergency Center

Hospital Services	Trauma and emergency medical care, Trauma and Emergency inpatient and outpatient services, Trauma and Emergency Operation, ICU and HDU, Radiology services, Laboratory services, Blood transfusion, Physiotherapy, Pharmacy

Source: Dhulikhel Hospital Trauma and Emergency Center, 2021

2.2.4 Project Activities

2.2.4.1 Hospital Waste Management

The health care waste can be of hazardous and non-hazardous waste. The hazardous waste include infectious waste, blood contaminated waste and pathological waste. The non-hazardous waste includes general waste (paper, plastic, bottle, can etc.). In context of national scenario average per bed, waste generation per day in hospital was found to be 1.7 kg/ bed (Source: MoH, 2003). Based up this, the hospital will generate 170 kg of health care waste.

The category of health care wastes generated from the hospital is summarized in Table 2-3.

Table 2-3: Categories of Hospital Waste

Waste category	Description and examples
Infectious waste	Waste suspected to contain pathogens e.g., laboratory cultures; waste from isolation wards; tissues (swabs), materials, or equipment that have been in contact with infected patients; excreta
Pathological waste	Human tissues or fluids e.g., body parts; blood, and other body fluids
Sharps	Sharp waste e.g., needles; infusion sets; scalpels; knives; blades; broken glass
Pharmaceuticals waste	Waste containing pharmaceuticals e.g., pharmaceuticals that are expired or no longer needed; items contaminated by or containing pharmaceuticals (bottles, boxes)
Chemical waste	Waste containing chemical substances e.g., laboratory reagents; film developer; disinfectants that are expired or no longer needed; solvents

Waste Management

The collected wastes will be screened at the source, and hazardous and non-hazardous wastes will be segregated. The treatment methods depend upon the types of waste materials, which include incineration, chemical disinfections, autoclaving, encapsulation, etc.

Table 2-4: Waste Management in wards of the Trauma Center

Waste Categories		Color Bucket used for waste collection	Examples
Non-risk Waste	Biodegradable Waste	Green	Leftover food items, fruits
	Non-biodegradable	Blue	Plastic covers, bags, plastic bottles
Risk Health Care Waste	Pathological waste	Red	Human tissues, organs or fluids; body parts; unused blood products

	Sharp waste	Red	Used or unused sharps (e.g. hypodermic, intravenous or other needles; auto-disable syringes; syringes with attached needles; infusion sets; scalpels; pipettes; knives; blades; broken glass)
	Infectious waste	Red	Used IV sets, uro bags, catheter dressing gauzes, cotton, bottles contaminate blood or body fluids
	Pharmaceuticals waste	Red	Pharmaceuticals that are expired or no longer needed; items contaminated by or containing pharmaceuticals.
	Cytotoxic waste	Red	Containing substances with genotoxic properties (e.g. waste containing cytostatic drugs – often used in cancer therapy; genotoxic chemicals)
	Chemical waste	Yellow	Waste containing chemical substances (e.g. laboratory reagents; film developer; disinfectants that are expired or no longer needed; solvents; waste with a high content of heavy metals, e.g. batteries; broken thermometers and blood pressure gauges).
	Radioactive waste	Black	Waste containing radioactive substances (e.g. unused liquids from radiotherapy or laboratory research; contaminated glassware, packages or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources).

Source: National Health Care Waste Management Standards and Operating Procedures, 2020

All types of infectious waste will be disposed of by making disinfection. Needle cutters will be used to destroy needles, and the waste will be collected separately. Autoclaves will be used to sterilize the infectious equipment. Similarly, sharp waste like syringes, needles, and broken glasses is disposed of safely in a sharp pit. The recyclable wastes will be sold to vendors. Besides this hazardous and non-hazardous waste, e-waste will also be generated from the hospital. E-waste generated from the hospital includes the battery, charger, cable line, etc. E-waste will be managed by selling to vendors. Besides this, the hospital will follow the Rules prescribed by MoHP and WHO for the safe disposal of waste. The health care waste generated from the hospital will be disposed of and treated as per the National Health Care Waste Management Standards and Operating Procedures, 2020. The hospital will follow the 6R principle (Reduce, Reuse, Recycle, Rethink, Repair and Refuse) for management of health care waste. Beside this, the proposed Trauma Centre will also coordinate with Dhulikhel Municipality to proper management of Health care waste generated from the trauma centre.

Table 2-5: Waste management plan

Type of waste	Management practices	Remarks
Canteen waste	To waste collection system	Composting
Hospital waste		
Sharps and Needles management	Needle destroyer	Other general wastes are handled over to waste management system.
Chemical waste	Neutralize with chemicals	
Infectious waste	Autoclaving	
Pathological waste	Anaerobic digestion/Biogas	
Hazardous waste	Use autoclave to treat hazardous waste	
Pharmaceutical waste	Return back policy/ Encapsulation	

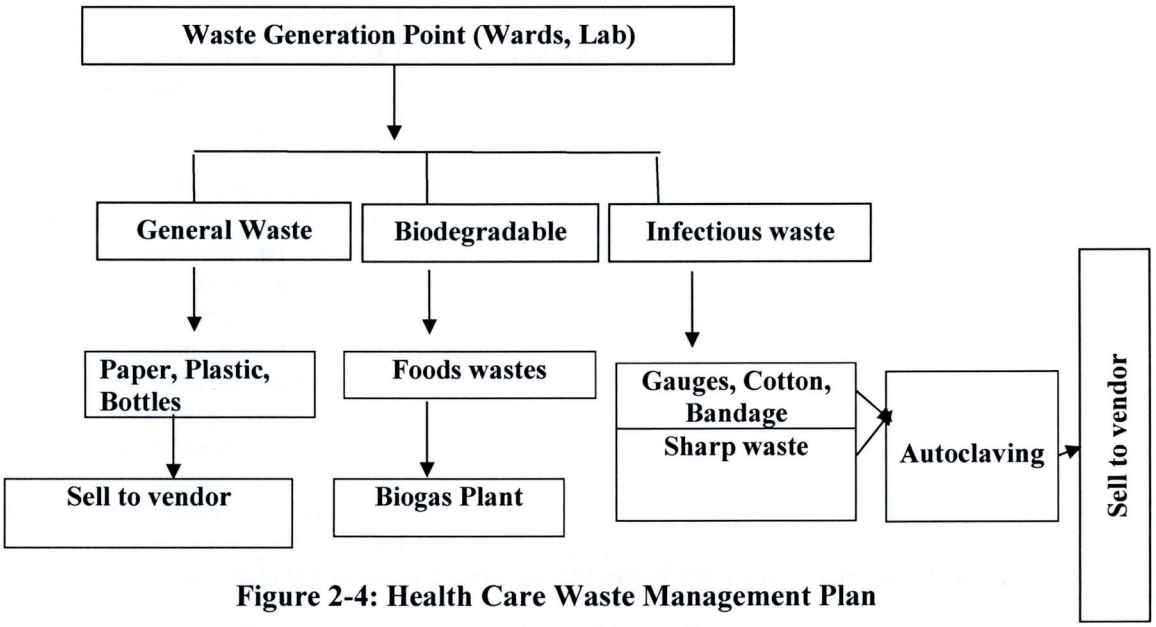


Figure 2-4: Health Care Waste Management Plan

Current scenario of waste management in Dhulikhel Hospital:

The Hospital Waste Management Unit under Dhulikhel Hospital, established in 2012 AD, has taken the initiative to control waste management procedures to properly dispose of biological wastes. The hospital has formulated a protocol for waste management. Before waste reaches the collection site, it is first segregated in the source. Hospital has provided four bucket systems for non-infected waste like plastics, papers, bottles, and food materials. Similarly, a separate bucket system for infected waste such as needles and sharps are separately discarded in safety boxes. After that, waste is transported using transportation vehicles. However, before that segregated waste materials are safely transported to the segregation unit hygienic staff of the hospital, where they wear personal protective equipment while handling waste materials.

Plate 2-1: Waste collection centre in Dhulikhel Hospital

Plate 2-2: Waste Autoclave machine to disinfect the infectious waste

All wastes are inspected in the waste management shed by hygienic staffs and it undergoes various procedures. Immediately after waste reaches in the waste management shed, infected and non-infected wastes are separately stored. Where, non-infected waste like, papers, plastics and bottles are segregated without any treatment. However, all the infected wastes are autoclaved and further segregated to reusable and non-reusable wastes. Whereas, reusable wastes are sold to the vendor which works as a source of income generation. In addition, Dhulikhel Hospital has a 2 years' agreement with N and N company Pvt. Ltd., Bhaktapur for management of reusable waste.

The health care waste generated from proposed trauma and emergency centre will be managed according to waste management practice applied in Dhulikhel hospital.

2.2.4.2 Drainage and Sewage Management

Biological wastewater treatment plant (Reed Bed system) which is already constructed in Dhulikhel Hospital will be used for treatment of wastewater generated from proposed Trauma Centre. The principle behind the Reed bed technology is to activate the microbial processes that stimulate the natural breakdown of polluting compounds in a specific wastewater situation. The Reed bed treatment plant is located at 300 m south direction from proposed trauma centre. The wastewater will be discharged only after treatment according to **Standard for Waste Water generated from Hospital, 2076.** The diagrammatic sketches of drainage and sewage management in Dhulikhel Hospital is shown in figure 2-5.

Plate 2-3: Reed Bed wastewater Treatment Plant in Dhulikhel Hospital

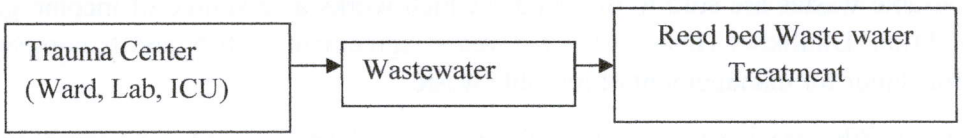


Figure 2-5: Drainage and Sewage Management in Trauma Center

2.2.4.3 Water Supply and Sanitation

Water demand during construction phase is estimated to be approximately 20,000 liters per day while during operation phase of the hospital is estimated to be approximately 45,000 liters per day. Water will be extracted from deep boring to fulfill the demand of water. The ground water extraction permission letter is attached in Annex II. For drinking purposes, underground water and municipal pipeline water will be used. Euro guard filter will be kept on each floor of the hospital to treat the drinking water. Toilets will also be available on every floor of the hospital. Cleaners will take the most care to maintain the cleanliness and hygiene level of each toilet as well as the hospital's in and outside premises.

Table 2-6: Water Source and Consumption

Particulars	Description
Water Source	Groundwater, Rainwater, Municipality supply, Tanker supply
Water consumption/day (For 100 beds) during operation	45,000 lit/day
Drinking water consumption	25,000 litrs/day
Water consumption for (Bathing, Laundry, Cleaning) purposes	20,000 litrs/day

Source: Dhulikhel Hospital Trauma and Emergency Center, 2021

2.2.4.4 Rainwater Harvesting and Groundwater Recharge

The rainwater harvesting system will be adopted in the trauma center for proper management of rainwater. The capacity of rainwater harvesting will be 20000 liter and capacity of storage tank will be 25000 liter. The rainwater will be used for gardening and toilet purpose. Open space will be allocated for the groundwater recharge. 4 recharge pits having capacity 2000 liter will be constructed in trauma building premises.

2.2.4.5 Emergency Preparedness

To prevent possible fire hazard, fire extinguishers will be fitted on each floor of the hospital. Beside this adequate information will be dispatched on the wall for fire safety measures like "No Smoking Zone." The building of the hospital will be constructed as per the National Building Code of Nepal. The proper security system, alarm, and PAS (Public Announcement System) for the emergency announcement. The hospital will provide training on occupation safety and evacuation to all staff including fire and earthquake safety.

Table 2-7: Safety and Disaster Preparedness

Particulars	Description	Remarks
Fire exit	Yes	
Fire Extinguisher	Yes	Each floor of the building
Emergency Alarm	Yes	Each floor of the building
Emergency Assembly Point	Yes	Disaster Management Storage in basement 3rd-floor plan
Security Guards	Yes	three persons
Coordination with Security forces	Yes	

2.2.4.6 Solar Energy

Solar PV panels will be installed in the hospital for water heating, laundry and CSSD on the hospital roof as the clean source of energy. The capacity of solar panel will be 100 kW. It helps reduce the use of diesel generators and helps maintain hospital surroundings environment friendly.

2.2.4.7 Food Hygiene

Food hygiene ensures the safety of food from production to consumption. Food can be contaminated during storage, distribution, transportation, and preparation. A lack of adequate food hygiene can lead to food-borne diseases. Hence, food hygiene will be maintained with safer management of catering in the hospital. The hospital will have a clean and hygienic canteen within the hospital area.

2.2.4.8 Mercury Free Hospital

Mercury is dangerous to public health and the environment, so its import and uses in the hospital will be prohibited in principle.

2.2.4.9 Management of Dead Body

Dhulikhel Hospital itself has forensic lab, so dead body from Trauma centre will be kept in forensic lab. In addition, Mortuary room will be constructed in Trauma Centre. Dead body will be safely stored and disposed of depending upon types of emergency and following local culture and customs. For instance, in disease pandemic situation which has a chance

to spread infection even from dead bodies will be avoided in contact with others and dispose of following national guideline of dead body management.

2.2.5 Construction material requirement for the project

The construction material required for the proposed project are RCC, Reinforcement, bricks, steel etc. The construction materials will be purchased from the local market. The type and required quantity of construction material is presented in Table 2-8.

Table 2-8: Construction material requirement

Type	Unit	Quantity
RCC	CUM	1950
Reinforcement	MT	280
Form Work	SQM	12,000
Brick Work	Cum	520
Tile/Marble	SQM	6500

Source: Dhulikhel Hospital Trauma and Emergency Center, 2021

2.2.6 Type, source and consumption of energy used

The source of energy and consumption by the hospital is given below;

Table 2-9: Energy Source and Consumption

Particulars	Description
Electricity Source	Dhulikhel Hospital Dedicated 11kV Feeder
Electricity consumption/month	175kW/Month
Fuel Consumption/month	80L/Month (Diesel oil)
Generator	1 (125 kVA)

Source: Dhulikhel Hospital Trauma and Emergency Center, 2021

2.2.7 Human Resource Requirements

The Dhulikhel Hospital Trauma and Emergency Center will be the special hospital for the treatment of trauma patients. Approximately 210 human resources will be required for the operation of the Trauma center. The details of human resources is presented in Table 2-10.

Table 2-10: List of Technical and Non-Technical Human Resources required for running 100 bedded Special Hospital

S.N.	Post	Human Requirement
a) Human Resources for good governance and management		
1	Medical Director / Superintendent Medical	1
2	Matron	1
3	Hospital Management officer / Administrator	1
4	IT officer	1
5	IT officer /Helper	1/3
6	Biomedical Engineer / Helper	1/3
7	Medical Recorder (Medical Recorder officer/ Helper	1/1

8	Hospital Finance Administrator (Account Officer /Accountant/ Account helper)	1/1
9	Storekeeper	1
10	Receptionist	1
	Total	**18**
(B) Human Resources for Clinical Services		
1	Medical Specialist	According to Department in hospital
2	General Physician	3
3	General Surgeon	3
4	Gynecologist and Obstetrician	3
5	Pediatrician	3
6	Anesthesiologist	3
7	Orthopedic Surgeon	3
8	General Practioner	3
9	Dental Surgeon	3
10	Dermatologist and Venerologist	3
11	Psychiatrist	2
12	ENT Surgeon	3
13	Pathologist	3
14	Ophthalmologist	2
15	Radiologist	5
16	Plastic , Reconstructive, Aesthetic and Hand Surgeon	2
17	Cardiologist	3
18	Neurologist	1
19	Neurosurgeon	1
20	Gastroenterologist	1
21	Nephrologist	1
22	Emergency Physician	1
23	Urologist	1
24	Neonatologist	1
25	Critical Care Physician	3
26	Medical Officer	24
27	Nursing Supervisor	3
28	Nursing Officer	8
29	Nursing Staff	40
30	Para medical Staff /HA	12
31	Senior Pharmacist/ Pharmacist Officer/ Pharmacy Assistant	1/2/5
32	Assistant Anesthetic	4
33	Dental Hygienist	3
34	Dental Assistant	1
35	MO/Optometrist	1/1
36	Ophthalmic Assistant	2
37	Medical Legal and Forensic Service	MD Forensic medicine -1, MO-1
38	Physiotherapy (Physiotherapist /Physiotherapy/Technician/ Assistant	1/1/2
39	Senior Dietician	1
	Total	**171**
(c) Human Resources for Hospital Support Service		
1	Nutrition Service	1-Senior Dietitian
2	Waste Management Officer	1
3	Grievance Redress Officer	1

4	Housekeeper	1
5	CSSD	3
6	Laundry and Housekeeping	2
7	Security	24 hour
8	BMET	1-Diploma
9	Social Service unit	5
10	HA	As per needed
11	Security	As per needed
12	Plumber	3
13	Electrician	3
14	Gardener	As per needed
15	Office Helpers	As per needed
	Total	**21**

Source: Health Facilities Operating Standard, 2077

2.2.8 Land Requirement

The total land area of the proposed project is 9423.48 Sq.m. and the total built-up area is 7327.627 Sq.m. The proposed Trauma and Emergency Center project will be operated under Dhulikhel Hospital. The land that will be used for the construction of the Trauma building is under the ownership of Dhulikhel Hospital. Besides this leased land will also be used for the operation of the hospital, and the ownership of lease land is under Ministry of Industry.

2.2.9 Construction Planning

a) Pre-Construction Phase

- Prepare a detailed feasibility report of the project.
- Conduct and study the environmental aspects of the project area.
- Prepare engineering drawing of the project
- Pre inform the local people about the proposed project.
- Bid invitation and contract approval process for construction work

b) Construction Phase

- Site clearance should be done for project construction
- Transport and storage of construction material will be performed
- Inauguration of construction work
- Construction of different structures of the building
- Fitting of electricity, plumbing.
- Installation of medical equipment in the hospital building

c) Operation Phase

- Maintenance of machines and equipment in the hospital as required
- To keep the clean environment in the hospital area
- To follow proper health care waste management in the hospital
- To maintain greenery around the hospital area

The layout plan is shown in figure 2-6. The construction work will start after the approval of the EIA report. The construction work will start from 2023-2024 AD.

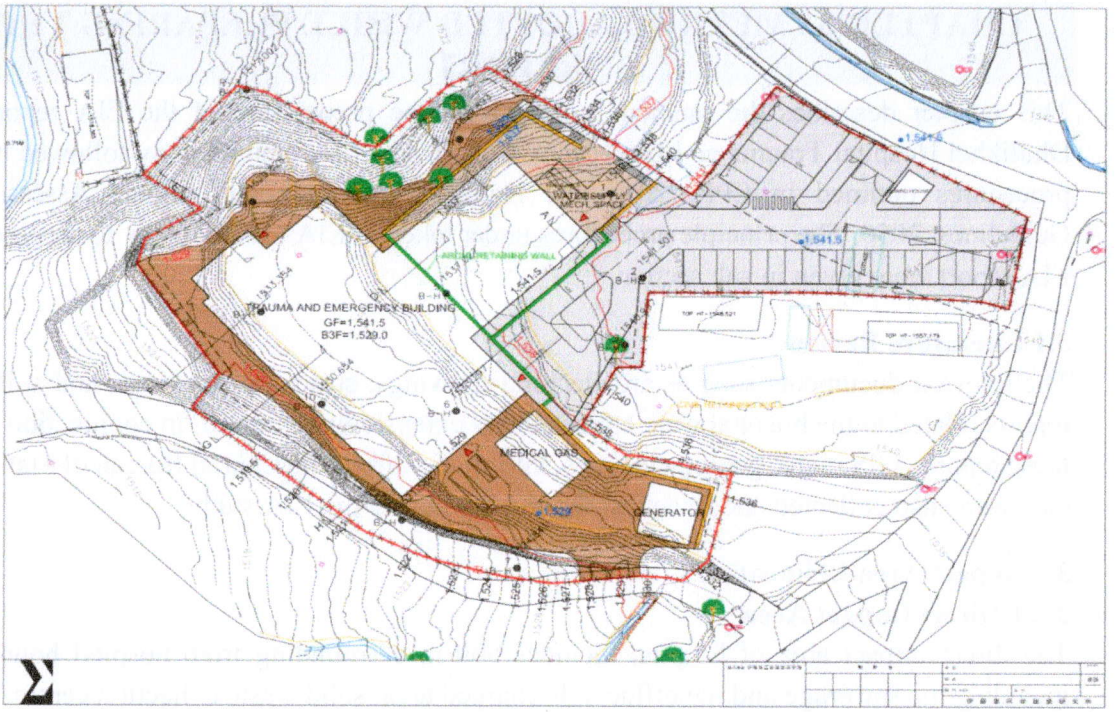


Figure 2-6: Layout plan for construction of Dhulikhel Hospital Trauma and Emergency center

(Source: Drawing and design report of hospital, 2021)

2.2.10 Construction Camp

Construction camp will be constructed within the boundary of the proposed project site.

2.2.11 Stockpiling Site

The stockpiling site will be allocated within the boundary of the proposed project site.

2.2.12 Spoil/muck management

The spoil and muck will be managed within the boundary of the proposed project site.

2.3 Objectives of Proposal

- The main objective of this proposal is to minimize the deaths and disabilities from trauma and accidents,
- This center would be to make it a Level I trauma center (Center of excellence for providing comprehensive trauma care), with a multidisciplinary approach for providing holistic trauma care services,
- Networking of available resources, training for specialists, medical officers, technical and paramedical staff, Trauma Information Division, and protocol for national trauma care system development

CHAPTER 3 : METHOD ADOPTED WHILE PREPARING THE REPORT

This chapter describes the methods used during the preparation of the EIA report of Dhulikhel Hospital Trauma and Emergency Centre. The EIA methodology followed basic procedures outlined in EPR, 2077 and National Environmental Impact Assessment Guidelines, 2050. The principle procedures under taken in EIA Methodology to prepare the EIA report were given in sub section.

3.1 Literature Review

The relevant documents such as architectural drawings, structural drawings, and soil test reports related to the hospital were collected and extensively reviewed. In conjunction with these reports, GIS maps, geological maps, information from the Central Bureau of Statistics etc., were also collected and reviewed thoroughly during the EIA study.

3.2 Impact Area Delineation

3.2.1 Direct Impact Area

The direct impact area of hospital includes 500 m surrounding from hospital boundary including the sewerage and the effluent discharged area, solid waste collection centre. This is the area, which include built up area of the hospital and nearby settlement.

3.2.2 Indirect Impact Area

The indirect impact area of the project includes beyond the direct impact area (500 m) of Dhulikhel Municipality and additional areas that will be affected due to the project operation, such as mobility of the people and road traffic, noise, and vibration. Certain aspects of the proposal affect the nation as a whole, mainly with regards to economic and health services benefits.

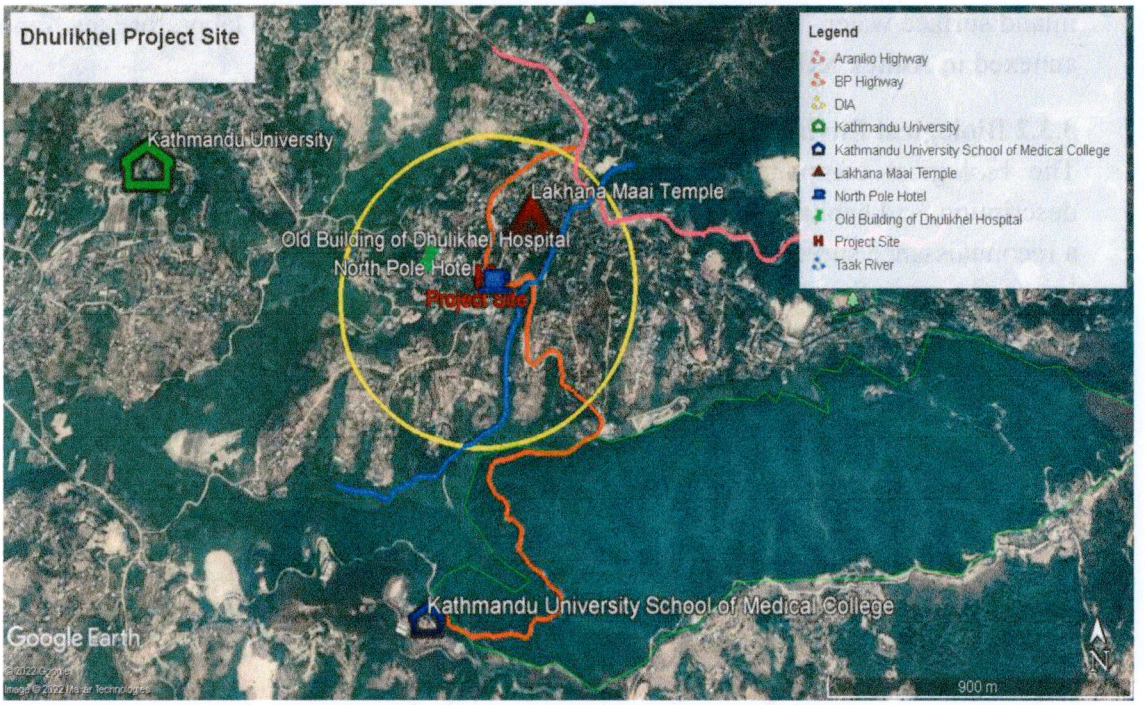


Figure 3-1: Project Impact Area Delineation

3.3 Field Study

Regarding the various environmental issues and to address those issues, an extensive site inspection was carried out by a multidisciplinary team led by the team leader, environmentalist, engineer, and socio-economist. During the visit, baseline information on the physical, chemical, biological, and socio-economic and cultural conditions of the project's direct and indirect impact areas were collected. During the field survey, physical, biological, and socio-economic and cultural environment data was collected. The sub-sections below briefly present the various approaches and methodological tools used during the field investigation. During the field visit, the team member discussed the potential issues with different people of that locality. A field visit was conducted from 2079/02/14 to 2079/02/27. During the visit, data on the physical, biological, socio-economic, and cultural environment were collected.

3.3.1 Physical Environmental Survey

The direct observation and walkthrough survey method was used to verify information on the drainage system, land stability, water sources, solid waste management system, groundwater condition, etc. Noise level around the proposed hospital site was measured by Sound level meter (SL-4001) for 24 hour. High volume sampler was used to measure the air pollution level. Similarly, soil sample was collected from proposed construction site and NPK value of soil was analyzed in ENPHO lab. The Horizontal-to-Vertical Spectral Ratio (HVSR) methodology was used as seismic technique that uses the environmental noise present everywhere in nature.The air pollution level was measured by a High volume sampler. Similarly, Water sample from Dhulikhel hospital was collected and analyzed with drinking water standards and Tolerance limit for industrial effluent to be discharge in to

inland surface water. The water was analyzed in ENPHO lab. The laboratory test report is annexed in **Annex XII.**

3.3.2 Biological Environmental Survey

The biological component generally refers to flora and fauna, their present status, description, and habitats. The status of flora and fauna of the study area was determined by a reconnaissance survey of the project area and surrounding area as well as key informant interviews and discussion with local informants. Photography and bird watching were conducted to collect the data of birds around the project area. Checklist was used to collect field level information.

3.3.3 Socio-economic Survey

Secondary data were collected to understand socio socio-economic conditions in the project area. Key Informant's Interview and public consultation were conducted to collect baseline information on socio-economic, cultural, and historical aspects of the area. The survey was so designed that it comprised the questions of demography, economic status, literacy, ethnicities, religion, and views regarding the project, expectations from the project, historical and archaeological significance of the project area. Key informant's interview were conducted with key person.

3.3.3.1 Key Informant's Interview:

Key informant interview were conducted with business person, teacher, Ward Chairman, Ward member and hospital staff of the project area. Five key informants were interviewed during field visit. The main objective of KIIs was to collect the specific data from key person.

Table 3-1: List of Key Informant's

S.N.	Name of Key Informant's	Position	Address
Data containing personal information is not disclosed.			

3.3.3.2 Public Consultation:

Public consultation were conducted with local stakeholders. The purpose of the consultation was to inform them about the project, collect their concerns/views regarding the project such

as project purpose, project type, impact area, likely impacts and potential opportunities due to project implementation. Two public consultations were conducted on 2079/02/14 with Pariwartanshil Women's Group and local people of ward no.6 of Dhulikhel Municipality and one consultation was conducted on 2079/02/27 B.S with Lasakusha Yuwa Club to collect the public's views and comments on proposed project.

Plate 3-1: Public Consultation with Pariwartanshil Women's Group

Plate 3-2: Public Consultation with Lasakusha Yuwa Club

Table 3-2: Issues raised by Stakeholders during Public Consultation

Public Consultation	Number of Participants	Raised Issues	Where considered in Report
Pariwartanshil Women's Group (2079/02/14, Chochhe Tole, Ward no.6, Dhulikhel Municipality)	12	• Employment opportunity should be given to Pariwartanshil women's groups. • Hospital waste should be properly managed. • Vocational training should be given. • Proper arrangements should be made for parking in the hospital.	All the raised issues are incorporated in chapter 8.
Dhulikhel Municipality-6 (2079/02/14, Chochhe Tole, Ward no.6, Dhulikhel Municipality)	Female : 13 Male : 7	• Provide employment opportunities to local people. • Noise pollution in the locality should be controlled. • The internal management of the hospital as well as the hospitality / facilities should be taken into consideration. • Proper management of waste should be during construction. • Congestion will be reduced by providing coupons to patients. • Discount facility should be given to the needy families and the disabled person for treatment. • Proper management of hospital waste generated from hospital should be done.	All the raised issues are incorporated in chapter 8.

Lasakusha Yuwa Club (2079/02/27, Ward no.6, Dhulikhel Municipality)	Male : 12 Female :3	• Provide employment opportunities for local people. • Provide employment opportunities especially for Lasakusha youth club people. • Hospital will provide financial support to this youth club. • Proper management of hospital waste generated from the hospital. • The hospital should be constructed and operated in an environment friendly manner. • Special discounts should be provided for the treatment of helpless and deprived people.	All the raised issues are incorporated in chapter 8.

Table 3-3: Detailed opinions in the stakeholder Meeting (2079/02/14)

S.N.	Major opinion and Answer					Where incorporated
	Question/Comment		Answer		Reaction of questioner	
	Name/Position	Question/Comment	Position	Answer		
1.	Engineer (male)	How will you manage the hospital waste?	Dhulikhel Hospital	Proposed Trauma center will follow same process as in waste management in Dhulikhel hospital.	Accepted the answer	Incorporated in chapter 8.
2.	Engineer (male)	How will you manage the waste water?	Dhulikhel Hospital	Planning to manage wastewater in Dhulikhel Hospital wastewater treatment plant.	Accepted the answer	Incorporated in chapter 8.
3.	Engineer (male)	How will you manage drinking water in Trauma center?	Dhulikhel Hospital	Drinking water will be supplied from Dhulikhel municipality pipeline and also well water will be used to fulfill water demand.	Accepted the answer	Incorporated in chapter 8.

4.	Local People (female)	What about demarcation of Raj Kulo (boundary), land, and land acquisition process?	Dhulikhel Hospital	Demarcation of Rajkulo will be fixed very soon with presence of local people and private land is already purchased	Accepted the answer	Incorporated in chapter 8.
5.	Deputy Mayor (female)	The Trauma center building should be disable friendly with child friendly and should have separate room for breast feeding	Dhulikhel Hospital	The Trunma center building will be built with disable friendly (construct ramp, lift etc.) and there will be separate rooms for breast feeding.	Accepted the answer	Incorporated in chapter 8.
6.	Ward Chief (male)	Employment opportunity should be provide to the local people according to their qualification	Dhulikhel Hospital	Hospital management team will decide about priority to give employment opportunity to the local people.	Accepted the answer	Incorporated in chapter 8.

3.4 Public Hearing

Background:

According to EPR 2077, Public hearing is mandatory for environmental study. The main aims of public hearing is to inform about the project and to collect the views and concerns from local stakeholders.

Methods and Procedure used to conduct Public Hearing:

Public notice had published displaying the information about public hearing in a local newspaper. The proponent also request the concerned local body for involve in public hearing program by registering the letter to the concern offices. Besides this, Information about the public hearing was also broadcast on local radio.

Table 3-4: Overview of the Public Hearing

Name of Meeting (date and venue)	Agenda	Major Attendee	Methodology
Public Hearing (10:45-12:30 / 14th of June 2022 at the Conference Room of the Dhulikhel Municipality)	Opening Remarks Project Outline Alternative Analysis of the Building Location Environmental Impacts, Enhancement and Mitigation Measures Environmental Management Plan Environmental Monitoring Plan Environmental Auditing Plan Conclusion and Commitment Exchange Opinions Closing Remarks	Participants: Local People, Dhulikhel Municipality, Dhulikhel Municipality Ward number 6, Dhulikhel Hospital Number of Total Participants; Total 44 (Male 41, Female 3)	1) Information Disclosure Direct informing 2) Language Nepali

Major Activities Accomplished in Public Hearing Program:

The public hearing was held at the Conference Room of the Dhulikhel Municipality, Dhulikhel, on Tuesday, June 14, 2022 (2079-02-31 Nepali Date) from 10:45 AM to12:30 PM. This location was compliant with the Dhulikhel Hospital and MoHP in cooperation with Japan International Cooperation Agency (JICA) Study Team. The meeting was attended by public members from ward-6, Dhulikhel municipality staffs, Hospital representatives, ward number 6 members, and local business owners. In total 44 people attended the meeting, including administrative director of hospital, JICA study team members, municipality and ward 6 members. Copy of the meeting roster and listing the attendees at the meeting is included in Annex VI.

The public hearing was conducted in a conference hall where, a consultant was available to record comments from the public. Moreover, the presentation was begun by Mr. Surendra Dev Bhatta where, he illuminated about the details on EIA process for the hospital enactment. Meanwhile, he demonstrated the slides in outline of EIA report in front of all participations. After that, members of the public provided verbal comments through discussions with project staffs during the public hearing. The public was notified that these comments were formal and would be responded to in the decision document. To make a formal comment, the public was encouraged to dictate a verbal comment to the consultant during the presentation, however, some also speak at the microphone after the presentation, or submit a written comment on a comment form. Moreover, all comments were addressed by two members from hospital management team i.e., Er. Rajaram Parajuli and Dr. Deepak Shrestha. Thenceforth, four people gave final speech at the microphone following the presentation; where, each speaker was given 5-10 minutes to make their perspective towards project; while, participants were reminded that their views would be responded to their benefits. Firstly, the chief administrative officer of Dhulikhel municipality named as Mr.

Taranath Luitel; where, he was the chief guest of the program, he addressed some comment from public and gave feedback in their support. In second, a guest of the program, which is female ward member namely Mrs. Ramdevi Manandar from Dhulikhel municipality ward 6; she also gave her point of view towards public well-being. After her speech, Mr. Sanjay Koju a chief of Dhulikhel municipality-6 who was addressed as a special chief guest in the program where, he gave some words with regard to the project enhancement with full support from ward-6. Lastly, the program president Dr. Ramesh Makaju who is the administrative director of Dhulikhel hospital; he gave his own perspective regarding the project and conclude the program.

Plate 3-3: Chairing Session

Plate 3-4: Welcome Speech by Proponent

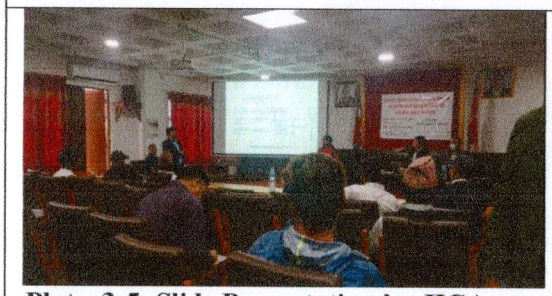


Plate 3-5: Slide Presentation by JICA team

Plate 3-6: Issues Raised by Public Participants

Plate 3-7: Public hearing addressed by Chief Guest

Plate 3-8: Public hearing addressed by Special Guest

Plate 3-9: Public hearing addressed by Guest

Plate 3-10: Addressing Issue Raised by Public Participants by Proponent

Plate 3-11: Public Participants in Public Hearing Program

Plate 3-12: Public Hearing Closing Session

Table 3-5: Opinions in the Public Hearing Program

S.N.	Major opinion and Answer				
	Question/Comment		Answer		Reaction of questioner
	Name/Position	Question/Comment	Position	Answer	
1	Engineer (male)	How will you manage the solid waste?	Dhulikhel Hospital	Trauma center will follow health care waste guideline 2020 to manage solid waste. Segregation of waste from the source and infectious waste will be made non-infectious by using autoclave and 3R principle will be followed.	Accepted the answer
2	Engineer (male)	How will you manage the liquid waste?	Dhulikhel Hospital	Proposed Trauma center will follow same process as in liquid waste management in Dhulikhel Hospital for which certain land area is allocated for installation of wastewater treatment plant.	Accepted the answer
3	Local People (Male)	How will you manage drinking water in Trauma centre?	Dhulikhel Hospital	Drinking water will be supplied from Dhulikhel municipality pipeline and also ground water will be used to fulfill water demand.	Accepted the answer
4	Local People (Male)	Project building should be constructed	Dhulikhel Hospital	Building of project will be constructed only after the	Accepted the answer

		only after approval of drawing.		approval of drawing from municipality.	
5	Local People (Male)	How will you manage parking issue?	Dhulikhel Hospital	Sufficient land is allocated for parking.	Accepted the answer
6	Local People (Male)	How will you dispose wastewater without affecting the agricultural sector?	Dhulikhel Hospital	Planning to manage wastewater in Dhulikhel Hospital wastewater treatment plant	Accepted the answer
7	Ward Female Member	Employment opportunity should provide to the local people according to their qualification.	Dhulikhel Hospital	Hospital management team will decide about priority to give employment opportunity to the local people.	Accepted the answer
8	Ward Chief (Male)	Proper management of Mercury waste and Canteen waste should be done.	Dhulikhel Hospital	Mercury free instrument and equipment's like thermometer, BP set will be used.	Accepted the answer

3.5 Notice Pasting and Publication

A draft public notice was pasted in the project-affected municipality office, ward office, government school, and health post to seek written opinions from the concerned people and institutions on the possible impacts of the implementation of the project. "Muchulka" were also prepared at the time of draft notice pasting. After pasting the draft notice same notice was published in "Aarthik Abhiyan" daily newspaper date on 2079/03/07, which is attached in **Annex VIII.** The public notice was prepared according to Schedule 9 of EPR, 2077.

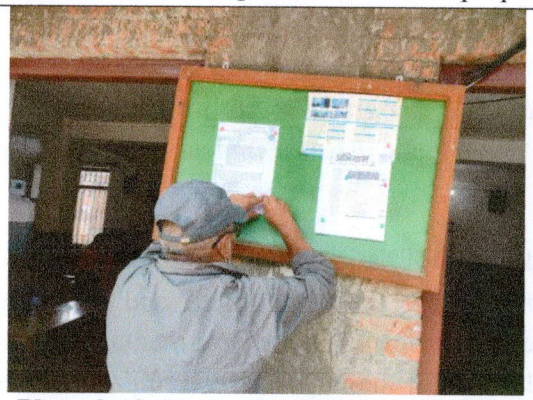


Plate 3-13: Notice Pasting at ward office

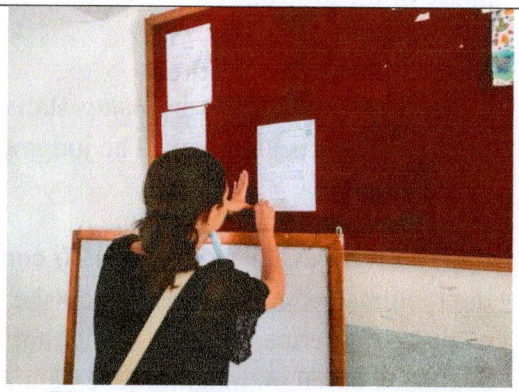


Plate 3-14: Notice Pasting at School

3.6 Data Analysis

3.6.1 Physical Environment:

GIS and Google map were used to analyze the data related to land use in the project site. The noise level data were analyzed as, $Leq. = 10\log 10 \sum_{i=1}^{n} (10\ Li/10) * t$. Where, n= total

number of sample taken, i=noise level in sample and t=time fraction. The air quality was measured and compared with National Ambient Air Quality Standard, 2012. Ambient noise data was utilized to compute Horizontal to Vertical Spectral Ratio (HVSR) using Nakamura (1989) which gives soil fundamental frequency and amplification factor.

3.6.2 Biological Environment:

In order to know the conservation status of fauna and flora, the list of protected fauna and flora of the Government of Nepal was used. Similarly, compiled according to the list of Red Book of the International Union for Conservation of Nature and in the appendix to the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Mobile Camera and DSLR camera were used to capture the image of birds and animals.

3.6.3 Socio-economic and Cultural Environment:

The data related to socio-economic and Cultural Environment were analyzed by using excel, charts.

3.7 Impacts Identification, Prediction and evaluation methods

The following methods were used to identify impacts, predict and evaluate the project activities on the environment:

Expert judgment

Expert system incorporates the knowledge and experience of experts from the relevant disciplines into the structure decision making analytical tools. The judgment and prediction likely outcomes are the integral part of an expert judgment.

Impact Matrix

An impact matrix were developed and used to identify project impacts on physical, biological and socio-economic environment and cultural environment during operation phase of the project.

Impact prediction methods

Impacts were predicted by using statistical tools, geographical information system (GIS) field and experts judgment. The judgment refers to the use of technical or local expertise.

Impact evaluation methods

Impacts were evaluated taking into consideration of national policies, laws, standards and international commitments. Once the impacts have been identified and predicted, and evaluated in terms they are significant and insignificant. The environmental impacts were evaluated based on magnitude, extent & duration of the impact. If the impact lasts up to 3 year, it is termed as Short term (ST). If impact continues for 3 to 20 years, it is termed as Medium term (MT) and if it lasts beyond 20 years, it is considered as Long term (LT) (National EIA guidelines 1993).

For the impact evaluation, the matrix method with numerical ranking was used for the quantitative ranking of the predicted impacts.

Table 3-6: Numerical Scale in the National EIA Guidelines, 1993

Magnitude	Score	Extent	Score	Duration	Score
High/Major	60	Regional	60	Long Term	20
Moderate/Medium	20	Local	20	Medium Term	10
Minor/Low	10	Site specific	10	Short Term	05

Source: National EIA Guidelines, 1993

The maximum scores will be 140 and a minimum value will be 25, which will help to know about the significance of impacts. The cumulative scores on these analyses were used to decide on the significance of the impacts.

Table 3-7: Cumulative scores of level of significance

Total scores	Significance of Impacts
<45	Insignificant
45 to 75	Significant
>75	Very significant

Magnitude:
This can be Low-**L** (minor), Medium-**M** (moderate), and High-**H** (major), depending on the scale or severity of change.

Geographical extent:
If the action is confined to the project area, it is referred as site-specific (**SS**), if it occurs outside area but close to project area, the extent of impact is local (**Lo**), if it occurs far away from the project, it is referred as regional (**R**).

Duration:
It can be Short Term (**ST**-i.e. less than 3 years), Medium Term (**MT**-i.e. 3-20 years), and Long Term (**LT**-i.e. more than 20 years).

3.8 Recommendation Letter Collection

Recommendation letter was collected from Dhulikhel Municipality and ward no.6 as per schedule 14 of Environment Protection Rules 2077, which is attached in **Annex IX.**

3.9 Preparation of EIA Report

This EIA report of Dhulikhel Hospital Trauma and Emergency Centre was prepared according to format given in Schedule 12 of EPR 2077.

CHAPTER 4 : REVIEW OF LEGAL DOCUMENTS

The following Policies, Acts, Rules, Regulations, Guidelines, Standards and Conventions were reviewed during preparation of EIA report. The proponent is committed to implement following legal documents during construction and operation of project. Any other laws attracted besides that mentioned below will also be followed by the proponent during the implementation of the project.

Review of legal Document	Attracted articles /Policies /Act/ Rules / clauses / related to the Project
Constitution of Nepal	Article 30 of the constitution states each person shall have the right to live in a healthy and clean environment. The victim of environmental pollution and degradation will have the right to be compensated by the pollutant as provided for by law. Article 3 (35) states about the right of Health of citizens.
Plans	
15thPlan, 2076/77-2080/81	The 15th five-year plan health sector goal is to ensure access to quality health services at the population level by strengthening and expanding health system at all levels and objectives are: • Develop and expand all types of health services equitably in central, province and local level. • Enhance the government's responsibility and effective regulation for ensuring accessible and quality health service; transform health sector from pro-profit to service sector. • Increase access to and utilization of health services through multi-sectorial coordination and collaboration; make service providers and service users more responsible and promote healthy life style.
Nepal Health Sector Strategy Implementation Plan, (2016-2021)	The overall goal for the health sector is to improve the health status of all people through an accountable and equitable health service delivery system.
Second Long Term Health Plan, (2054 – 2074)	The SLTHP aims to guide health sector development in the improvement of the health of the population; particularly those whose health needs are not often met.
Policies	
National Health Policy, 2076	The National Health Policy, 2076 was adopted to improve the health condition of the people of Nepal. The primary objective of the National Health Policy is to extend the primary health care system to the rural population so that they can get benefits from modern medical facilities and trained health care systems.

National Environment Policy, 2076	The main objectives of the National Environment Policy area; • To prevent and mitigate water, air, soil, noise, chemical, radioactive pollution • To manage solid waste generated from household, industry, and other areas • To develop garden and greenery in Urban area • To mainstream environment in all development area • To ensure public participation for environment protection and sustainable management of natural resources
National Climate Change Policy, 2076	The main objectives of the National Climate Change policy are as follows: • To reduce GHG emissions by promoting the use of clean energy, such as electricity, renewable and alternative energies, and by increasing energy efficiency and encouraging the use of green technology; • To adopt a low-carbon development path by pursuing climate-resilient socio-economic development
Nepal Health Sector Strategy, (2072-2077)	The goal of this strategy is to improve the health status of all individuals through a minimum health care delivery system. It embodies the philosophy and goals set out in the National Health Policy and have a constitutional provision guaranteeing access to essential health services as a fundamental right of every citizen. This strategy demonstrates the nation's commitment to achieving International Health Coverage (IHC), and this strategy provides a basis to mobilize the necessary resources and investments.
Acts	
Federation, Province and Local Level (Coordination and Inter-relation) Act, 2077	Sections 16, 17 and 18 The formation and functions, duties and powers of the National Coordinating Council, the formation and functions, duties and powers of the Provincial Coordinating Council and the functions, duties and powers of the District Coordinating Committee have been arranged.
Environment Protection Act, 2076	Article 3 mandates IEE/EIA study for development projects; Article 4 describes about implementation of alternative analysis; Article 6 prohibits the emission of pollutants beyond the prescribed standards; Article 7 describes about the approval of the environmental study report.
Land Use Act, 2076	Clause 4, Clause 8, Clause 10 and Clause 25 of this act, the classification of land use area, not to change land use, control of fragmentation of land, punishment has been clearly mentioned.
Children Act, 2075	Article 66 of this Act describe about the offence of child abuse, and Article 3 to 15 describe children's right

Consumer Protection Act, 2075	Chapter-2 of this Act describes about provisions relating to consumer protection. Under chapter 2(3), there is provision of the consumer's right, and every consumer shall have the right to obtain quality goods and services. Similarly, chapter 2 (4) states that regulation of goods or services and the government shall regulate the supplies, price, quality, measurement, label, and advertisement of the goods and services regularly to protect the consumers' rights.
Public Health Services Act, 2075	Subsection 1 of Article 40 of this act states that the government of Nepal may set standards in this regard under federal law to minimize the impact of noise, air, water, and visual pollution on public health. Similarly, Article 41 states that necessary sanitation and garbage management standards will be formulated.
Local Government Operation Act, 2074	This newly formed act describes about the criteria to divide a state into municipalities or rural municipalities and respective rights, duties, and responsibilities in different development and conservation sectors. It clarifies the rights of municipalities/rural municipalities to form local laws, regulations, and criteria for the conservation of the environment protected areas and species; for environmental pollution and hazard control; solid waste management, etc.
Labor Act, 2074	There is a strong provision for a healthy, safe, and secured environment for workers and prescribes provisions for solid waste management and control of noise pollution into working areas under this Act. Apart from this, it has a mandatory provision that only Nepali citizens can be employed permanently in any enterprise.
Disaster Risk Reduction and Management Act, 2074	Sections 3 to 18 provides the establishment of various structures of the state for disaster risk reduction and management and the work, duties and rights have been arranged.
Contribution Based Social Security Act, 2074	According to section 4 of this act, the employers must pay a certain amount of money based on worker contribution, and article 10 stipulated the operation of a social operation scheme.
National Civil Procedure Code, 2074	Section 4, 16, 17 has arranged the principles to be followed in the civil case, matters of jurisdiction, matters to be appealed within the limits.
Criminal Code, 2074	Sections 33 and 34 and Sections 35 and 36 of this code have provisions related to criminal conspiracy and offence, abetment and non-corruption.
Health Insurance Act, 2074	Section 3 of this acts mentioned that it applies to health insurance. Section 8 mentioned about Health insurance facility
Nepal Vaccination Act, 2072	In relation to providing quality vaccination services by expanding and improving the development and improvement of vaccination services to reduce the mortality rate of infants,

	children, mothers or other persons by preventing or eliminating diseases through vaccination.
Solid Waste Management Act, 2068	As per Section 9, rule 38, (*Ta* and *Tha*) and rule 39 (8), haphazard generation, discard or collection of hazardous waste from industrial state or health care institutions will be considered as guilt and has the provision by the local government to penalize the fine of NRs. 50, 000 to 100, 000 for the first time. The penalty will be double for the repetition and will be recommended to concerned bodies for revoking the permission. Also, Section-10, rule 43 (1, 2) states that the respective authority should make sure that the healthcare institutions have the proper provision for waste management before issue the permission from its establishment and operation. The authority can also enforce necessary standards to be followed by healthcare institutions the solid waste in the public health and environment.
Security of the Health Workers and Health Organization Act, 2066	In section 3 of this Act, there is a provision of the prohibition on doing acts such as mishandling, lockout, and destruction. In section 5, there is a provision relating to the formation of a committee. The functions, duties, and powers of the committee shall be as follows: (a) To approve plans and programs relating to the security of the health workers and health organizations and implement, or cause to implement such plans and programs (b) To maintain coordination between the concerned bodies as to the security of the health workers and health organizations (c) To provide compensation, on behalf of the health workers and health organizations, to the concerned persons pursuant to court judgments (d) To give suggestions to the Government of Nepal on the policies to be pursued on the security of the health workers and health organizations
Company Act, 2063	Section 3 - Incorporation of Company: (1) Any person desirous of undertaking any enterprise with profit motive may, either singly or jointly with others, incorporate a company for the attainment of one or more objectives set forth in the memorandum of association.
Child Labor Prohibition and Regulation Act 2056	It has been mentioned that children should not be employed.
Building Act, 2055	This act aims to strengthen building against earthquake, fire and other natural calamities. Section 8 of this act classifies building in 4 categories based on floor number, plinth area and structural plan. According to section 10 of this act, it is mandatory to construct building as per the standards of building code. Section 11 of this act made compulsory to approve design and map of building. Section 14 (1,2 and 3) has provided the right to municipality and urban

	development office to stop construction of building without approved design and out of standards of building code and also provide right to demolish and charge fine for such buildings.
Drug Act, 2035	Section 12 states each drug shall be safe for public consumption, efficacious and of quality standard in such a manner as to keep on maintaining its prescribed quality standard. Section 14 states about If a drug which has already been marketed for sale and distribution is not safe for public consumption, efficacious and of quality standard pursuant to Section 12, the manufacturer or his/her agent shall get back such drug from the seller or distributor.
Essential Services Operation Act, 2014	Section 3 states the right of the Government of Nepal to restrict strike, section 4 to 6 of this acts provisioned the punishment for those who are committing, encourage and participate in strike on essential service operation.
Rules and Regulations	
Land Use Regulations, 2079	The Rule 8, mention about the basis, criteria and area of land use area classification.
Environment Protection Rules, 2077	The Rules has included three types of environment examination: brief environment study for project under schedule 1, Initial environment examination for the project that comes under schedule 2 and Environment impact assessment for the project that comes under schedule 3. Rule 4 of chapter 2 guides the scoping works, and Rule 6 guides for public hearings. Schedule 4 guides to prepare the scoping report. Chapter 3 mentions provisions related to pollution control.
Public Health Service Regulation, 2077	According to Chapter 2, Section 3 of Public Health Service Regulation 2077, Every citizen shall receive free basic health services from every basic health service center and health institutions designated by the Government of Nepal, Provincial Government and Local Level as mentioned in Schedule 1 under the headings pursuant to Sub-Section (4) of Section 3 of the Act.
Disaster Risk Reduction and Management Regulation, 2076	Rule 3 of this regulations state about the Duties and Powers of the Executive Committee, and rule 7 states about the Duties and Powers of District Disaster Management Committee.
Labor Rules, 2075	Rule 16 of the Labor Regulation provides flexibility to the employer to determine the work hours. The employer can determine the work hours based on the nature of the work of the entity. However, the notice of the work hours should be given to all the employees. The Labor Rules also provide that the employer may put the employee to work on rotation based on nature of its work.

Contribution Based Social Security Rules, 2075	In chapters 2 and 3 of this regulation, there is a provision of participation in the social security scheme and identity card, respectively. Rule 9 and 17 of the regulations mention the social security scheme business and development, respectively.
Health Insurance Regulations, 2075	Rule 3 states about contribution on insurance, 6 states about the health insurance, Rule 15 of this rule states about the Contribution in amount.
Solid Waste Management Rules, 2070	Rule 1 of this Rule stipulates the segregation of solid waste at least organic and inorganic solid waste at its source under section 6 to manage and segregate harmful and chemical waste separately.
Building Rules, 2066	Building Rules, 2066 guides to take the approval of design/map of the construction-building layout and follow the detail prescribed procedure mentioned in it. This shall be followed by the proponent prior construction work.
Guidelines/Directives/Decision	
Hospital Pharmacy Service Guidelines, 2072	The functions, duties, and responsibilities of this guideline are to prepare a list of medicines, to the inspection of hospital pharmacy from time to time, etc. This guidelines also has a provision of the infrastructure of hospital pharmacy which shall have; • Enough space for dispensing and storage of medicines • Appropriate storage condition • Easily accessible location of the pharmacy • Separate storage place for drugs to be returned and expired drugs • Provision of different places for free and non-free medicine
Health Institution Establishment, Operation, Standards and Infrastructure Guidelines, 2070	This Guideline contains the code of conduct required for health institutions and deals with the infrastructure and standards required for the operation of health institutions under different policies. The Guideline has directed the following provisions: • Allocation of 10% of total beds and health services for poor, disabled patients with free treatment and special facilities with required beds for elderly patients. • The hospital should obtain recommendation from Division Office, Department of Urban Development & Building Construction (DUDBC) stating that the construction of the building as per the standards of building code. • Arrangement of required number of human resources depending on the number of beds.

	• The hospital should prepare Disaster Management Plan. The contact person for this work should be provided to District Public/Health Office. • The hospital should prepare and implement Standard Operating Manual • Provision of Patient Charter in each service unit with cost • Provision of 55 m^2 land per bed
National Environmental Health Impact Assessment Guidelines for Development Projects, 2059	National Environmental Health Impact Assessment (NEHIA) Guidelines for project development deal with assessing the health impact of the various polluting activities, among other handling, treatment, and disposal of healthcare wastes.
National EIA Guidelines, 2050	GoN implemented the National EIA guidelines in July 1993, prior to the enactment of the environmental legislation to integrate environmental aspects in the development project and programs by conducting IEE or EIA. These guidelines call for identifying socio-economic, biological, physico-chemical, and cultural impacts and proposing mitigation measures to avoid, eliminate, minimize or mitigate each adverse impact to augment the beneficial impacts resulting from the project.
Work Policy on Registration, Use and Lease of Government Land, 2079	Section 6 of this work policy states that foreign diplomatic missions and UN-affiliated bodies in the country, inter-governmental organizations, universities, board committees or other autonomous organizations established under the province government or local levels and any organization registered in the Federal government, province government or the local level or and individual as well shall be eligible for acquiring land on lease. The period of lease shall be for a five-year (short-term), 15-year (mid-term) and 40-year (long-term). Section 7 mentioned that any organization meeting criteria for demanding the land on lease or any interested individual shall apply for it and the application charge is NRs 5,000. The work procedures require statements justifying reasons for demanding the land on lease and an action plan as well. More, recommendations of respective local level executive, recommendation of the Ministry of Foreign Affairs in case of foreign diplomatic missions and UN-affiliated intergovernmental organizations are necessary to proceed with getting the land on lease. In addition to this, the recommendation of the District Disaster Management Committee stating that it does not need the land for disaster

	management is also demanded by the procedure. There shall be a recommendation committee coordinated by Chief District Officer to make recommendations for the use or lease of government land.
Mercury Free Health Care Service and Mercury Free Dentistry decisions effective since 21 August 2019	According to high level decision of honorable deputy prime minister and minister for health and population, dated 2076/05/04 (21st August, 2019), equipment having mercury and dental alugam are prohibited for pregnant and breast feeding women. In case of other age groups, ban in use of mercury dental alugam within 5 years. The school, University or Academy of dental medicine should revise their curriculum accordingly and use of mercury dental alugum in practical exercise are prohibited.
Standards	
National Drinking Water Quality Standard, 2079	This standard sets the maximum limits of various parameters of drinking water.
National Health Care Waste Management Standards and Operating Procedures, 2077	This standard and operating procedures has directed provisions for Waste minimization, waste segregation and collection, waste storage and transportation/handling, waste treatment and disposal, and public awareness on health care waste as the initial and prime steps for Health Care Waste Management.
Health Facilities Operating Standards, 2077	This standard sets the maximum limits of human resources and health equipment's in the health care facilities.
Standard for Waste Water generated from Hospital, 2076	This standard specifies the standard of wastewater to be discharged from the hospital. The maximum limits of pH, BOD, COD, Hg, CN, Cd, oil and grease, fecal coliform are specified in this standard.
Town Development, Urban Planning and Building related Basic Guidance, 2072	According to point 5.3 of this standard, the local body will issue a certificate of completion only to the building recommended by the technician that the architectural drawing has been designed, supervision has been carried out following the building construction standards. The Nepal Engineering Council should investigate and take legal action against the technician who verifies the building drawing and design against the standards.
Standards related to operation of incinerator, smoke emitted from operation and height of chimney, 2071	This standard stipulates that the height of the chimney should be more than 11 meters and it should be more than the height of the houses in the area. Also, it has determined the limit of smoke emitted from the operation of the incinerator

National Ambient Air Quality Standard, 2069	The National Ambient Air Quality Standards, 2069 enforced by GoN has set quality standards for nine parameters: total suspended particles (TSP), particulate matter (PM 10), Sulphur dioxide, Nitrogen oxide, Carbon mono-oxide, lead, benzene, PM2.5 and Ozone for the maintenance of the ambient air quality. The project during its construction and operation will have to comply with the set standards for the ambient air quality.
National Standard of Noise Quality, 2069	The standard sets sound limits for day and night time for various regions
Standard on Emission of Smoke in Air by New and Existing Diesel Generator, 2069	This standard sets the standard for exhaust fumes from diesel generators
Nepal Vehicle Mass Emission Standards, 2069	The standard sets maximum limits on the quality of smoke emitted from various vehicles.
National Building Code, 2060	The national building code of Nepal was endorsed in Government building after cabinet decision in 2060/4/12. The code was endorsed in 58 municipalities; districts head quarter rural municipality and urbanizing rural municipalities in the country in 2005. The code deals primarily with the matters relating to the strength of the building sites considerations safety during construction and fire hazards, construction materials, electrical designs etc. It has provisioned that while designing the multi-storey building in municipalities and municipality city, the developers must follow the NBC.
Municipal bye law (Dhulikhel Municipality)	The building is designed according to requirements of the National Building Code (NBO) 2060 Nepal and within limits provided by building and planning By- laws 2072 B.S. **Dhulikhel Municipality, Kavrepalanchok** FAR: 2.5 for commercial usage building in Residential Sub-Zone, Ground Coverage: 40 % Maximum
International Conventions	
Minamata Convention on Mercury, 2013	The Minamata Convention on Mercury is global treaty aimed to protect human health and environment from the adverse effects of exposure to mercury. It was adopted on 10th October 2013 in Japan. The convention entered into force on 16th August 2017 with 128 signatories. Mercury is widely used in health care settings especially in medical equipment such as thermometers and sphygmomanometer.
The strategic Approach to International Chemical Management (SAICM) (2006)	SAICM, an international agreement aims to achieve the sound management of chemicals throughout their lifecycle, no matter where it was generated, by 2020. Nepal agreed to SAICM in 2006, with the implementation falling under the former Ministry of Environment, Science and Technology. SAICM ensure that the chemicals are used and produced in ways that minimize significant adverse effect on human

	health and the environment. It emphasizes the science based risk assessment of the chemicals in practice and assess the availability of safer substitutes and their efficacy.
The Stockholm Convention on persistent organic pollutants (POPs), 2001	This convention is global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are toxic chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of living organisms. The Stockholm Convention recommends prioritizing alternatives to incineration, which do not produce dioxins and furans. Nepal has signed the Stockholm Convention in 2007 (GoN 2017) and updated National Implementation Plan (NIP) for the Stockholm Convention in Nepal banned the open burning of waste in municipals areas.
Basel Convention on the Control of Trans boundary Movements of Hazardous Waste, 1989	The Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal was adopted in 1989 and entered into force in 1992. The central goal of the Basel Convention is "environmentally sound management" (ESM), the aim of which is to protect human health and the environment by minimizing hazardous waste production whenever possible. ESM means addressing the issue through an "integrated life cycle approach", which involves strong controls from the generation of a hazardous waste to its storage, transport, treatment, and reuse.

CHAPTER 5 : EXISTING ENVIRONMENTAL CONDITION

5.1 Physical Environment

5.1.1 Land Use Pattern

The proposed project site is located in barren land. The land use of the project surrounding area is grassland without any cultivation. Surrounding land use areas are residential/developed area, and forest on the slope unused. The land use pattern nearby hospital area is shown in fig.5-1 and fig. 5-2.

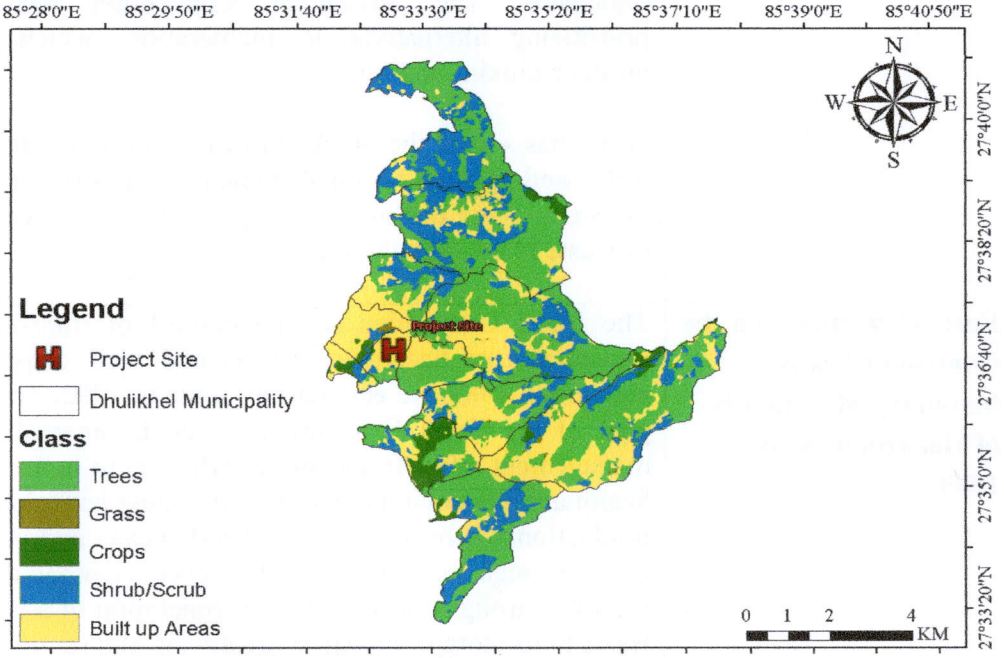


Figure 5-1: Land use pattern of project area

Figure 5-2: Land use patter of project area and surrounding area

5.1.2 Geology

The proposed hospital lies in the Lesser Himalaya zone. This zone constitutes consolidated phyllite and meta sand stone basement rocks and quaternary sediment of gravel, sand and carbonaceous clay. The study area comprises rocks of the Phulchoki Group. The rocks are low-grade metasedimentary (phyllite and meta sandstone) belonging to the Recent Formation.

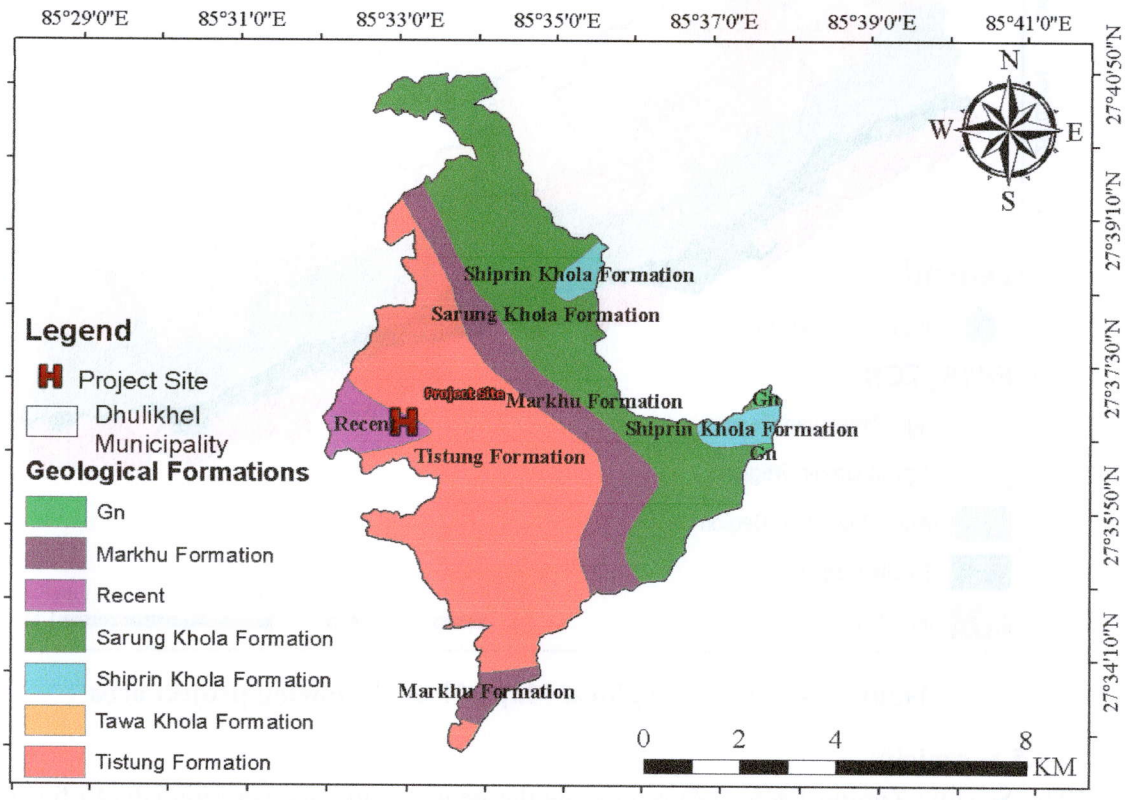


Figure 5-3: Geological formation of project area

5.1.3 Climate

The project area is located at an altitude of 1550 m; it is mild and refreshing throughout the year and warm in winter. Snowing is rare, even in winter. The average temperature in the warmest month is 24 ° C, and the average temperature in the coldest month is 10 ° C. Approximately three-quarters of the annual rainfall falls in the rainy season. The project area belongs to the temperate summer rain climate (Cwa) in the Köppen category. The average yearly rainfall is approximately 1,600 mm in the project area.

5.1.4 Topography and Geomorphology

Topographically, Kavrepalanchok district has an area of about 1396 Km^2 out of which Dhulikhel Municipality covers an area of 54.62 km^2 (CBS, 2011). The proposed project area is situated in Dhulikhel Municipality ward no 6. Geographically proposed project site is located at 27°36'58.13" N Latitude and 85°32'59.90" E Longitude. The project area is located at middle mountain region.

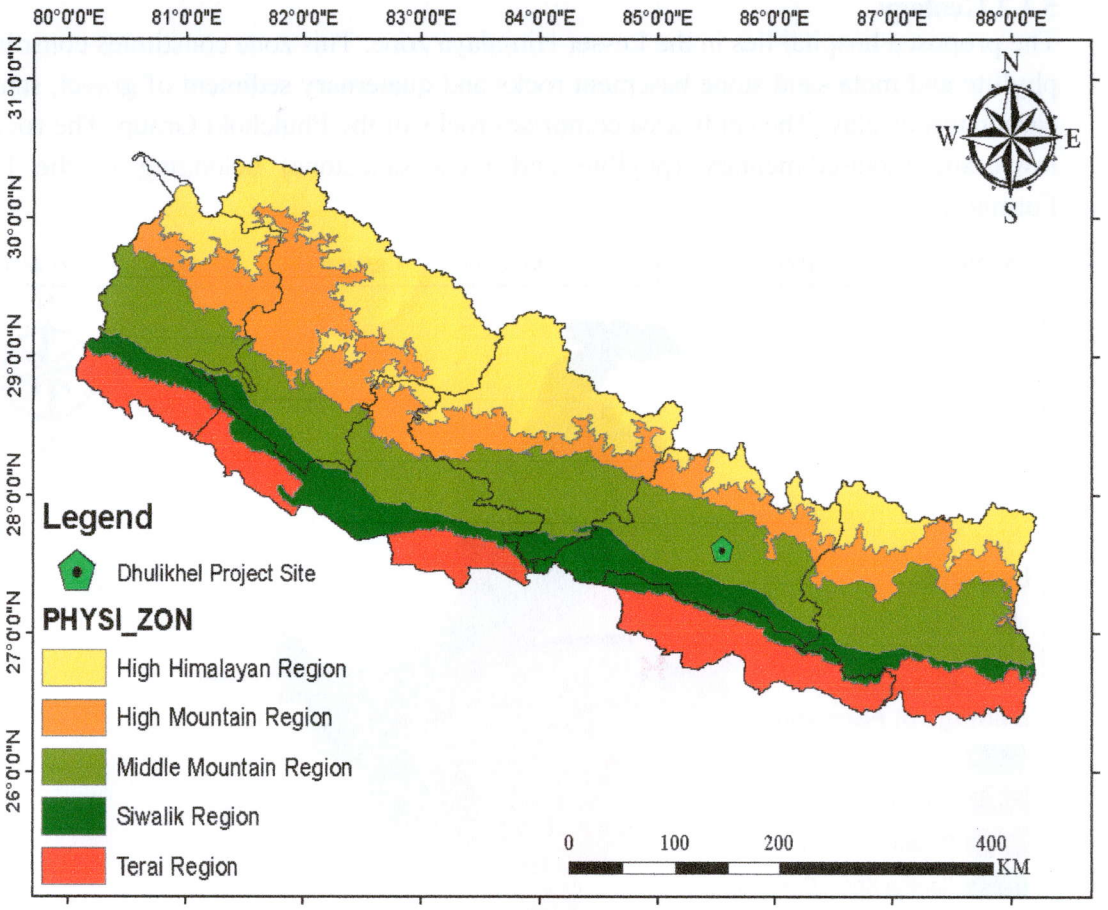


Figure 5-4: Physiographical Map of Nepal showing project area

5.1.5 Seismicity

The Seismic Zoning Factor (Z) represents the peak ground acceleration (PGA) for a 475-year return period. The value of the Seismic Zoning Factor (Z) of the Dhulikhel Municipality is 0.35

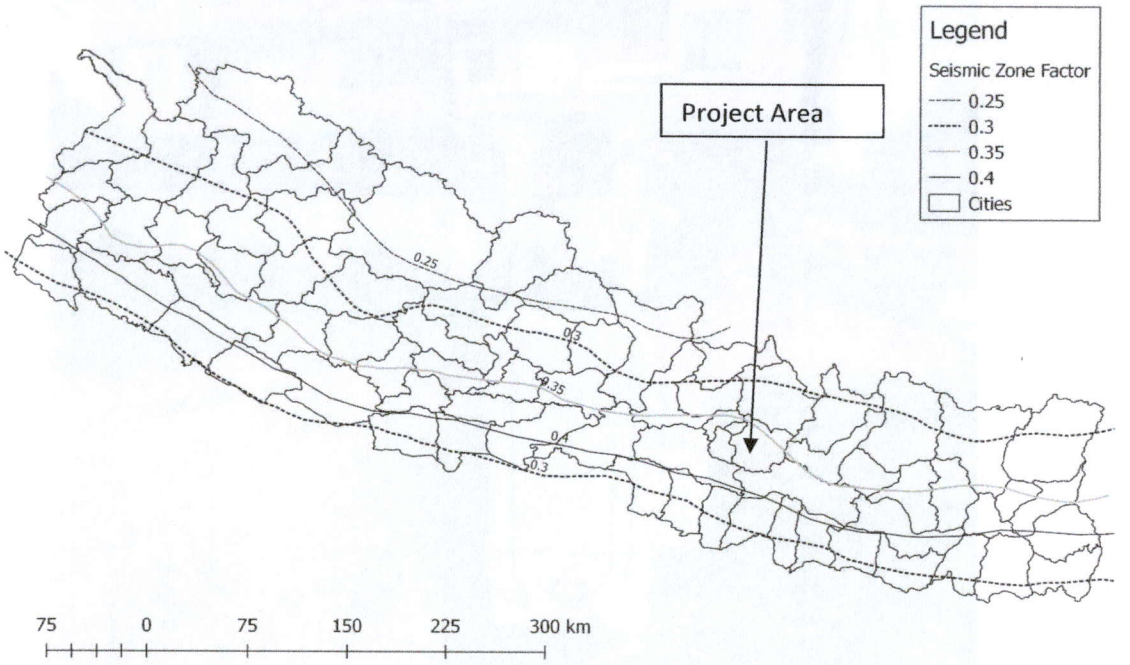


Figure 5-5: Seismic Zoning Map of Nepal

(Source: Nepal National Building Code NBC: 105:2020)

5.1.6 Air Quality

The samples for different air quality parameters was taken from three separate sites; hospital site, project site, and road site, which are represented by sites 1, 2, and 3, respectively. Among these three sites, site 1 is inside Dhulikhel Hospital's compound, site 2 (project site) and site 3 is situated near the highway. The weather conditions of that day were cloudier and slightly rainy while taking samples. Air sampling collection procedures were continuously carried out for 24 hours by High Volume Sampler.

Table 5-1: Air quality measurement of different sites of Project area

S.N.	Parameters	Location			National Ambient Air Quality Standard, 2012($\mu g/m^3$)
		Hospital Site (Site-1)	Project Site (Site-2)	Road Site (Site-3)	
1.	Particulate Matter (PM_{10}) ($\mu g/m^3$)	53.92	85.97	60.80	120
2.	Particulate Matter ($PM_{2.5}$) ($\mu g/m^3$)	15.49	28.07	21.87	40
3.	Sulphur Dioxide (SO_2) ($\mu g/m^3$)	1.54	2.67	2.14	80
4.	Nitrogen Dioxide (NO_2) ($\mu g/m^3$)	1.64	3.65	6.13	70
5.	Carbon Monoxide (CO) ($\mu g/m^3$)	<1000	<1000	<1000	10,000

Source: Field survey, 2021

Plate 5-1: Air quality measurement by Air volume sampler

The test results show that particulate pollutants such as PM_{10} and $PM_{2.5}$ are below the National Ambient Air Quality Standard range, 2012. The analyzed results of PM_{10} at the three sites were 53.92, 85.97, and 60.80 $\mu g/m^3$ respectively. Whereas, the observed value of $PM_{2.5}$ at the three different sites were 15.49, 28.07 and 21.87 $\mu g/m^3$, respectively. Likewise, the gaseous pollutants such as sulfur dioxide (SO_2) and nitrogen oxide (NO_2) at several locations/sites around the project affected area were 1.54, 2.67, 2.14$\mu g/m^3$and 1.64, 3.65, 6.13 $\mu g/m^3$, respectively. Similarly, the Carbon monoxide (CO) concentration was lower than 1000 $\mu g/m^3$ in all three distinct sites.

Overall, the concentrations of air pollutants at hospital sites is comparatively lower than both road and project sites. From the above data, the higher concentrations of particulate and gaseous pollutants is found in the project site, whereas; lower concentrations of these pollutants is found in the hospital site. This result concludes that the particulate matter and the gaseous pollutants are within the limit of the National Ambient Air Quality Standard, 2012. Considering the results, the ambient air quality within the periphery of the project area is assumed not to be polluted. Therefore, these data suggest that air quality is generally good, which is good for both health and the environment.

5.1.7 Noise Level

The sound level data (Noise level) were taken from three different sites; Hospital site, Project site, and Road site, which are represented by site-1, site-2, and site-3, respectively. The sound pressure level was measured with the help of a sound level meter device.

Table 5-2: Sampling Details, Test Results, and Interpretation

S.N.	Location	Latitude	Longitude	Time duration (continuous)	Measured Noise level Leq (dB)		Zonation	Noise level Standard of Nepal,2012	
					Day (06:00AM-22:00PM)	Night(22:00PM-06:00AM)		Day (dB)	Night (dB)
1.	Hospital site (NV-3)	27°37'1.07''	85°32'52.72''	24 hrs	48	43	Silent zone	50	40
2.	Project site (NV-2)	27°36'58.19''	85°32'58.79''	24 hrs	65	62	Mixed residential zone	63	55
3.	Road site (NV-1)	27°36'58.32''	85°33'1.55''	24 hrs	67	61	Mixed residential zone	63	55

Source: Field survey, 2021

Plate 5-2: Measurement of the Noise level in Project site by using sound level meter

The measured noise level of the three sites was different because the source of sound production is different in different areas. Different sources have different sorts of intensities, frequencies, and pitches of sound.

Here, the hospital site is categorized as a silent zone whose measured sound level is 48 dB and 43 dB in day and night, respectively. According to the measured value, the sound level of the hospital site exceeds the national noise level guidelines. Similarly, both project and road sites are categorized into mixed residential zones. For the project site, the average sound level is found to be 65 dB in the daytime while 62 dB in the nighttime, whereas; 67 dB in the day time and 61 dB in the night time at the road site. However, the measured sound

level at the mixed residential zone exceed the standard value of national guideline. Therefore, the project site and road site are affected by noise pollution.

5.1.8 Water Quality

The samples for different water quality parameters were taken from two different sites i.e., Hospital premises and Taak Khola near the project-affected area. The drinking water sample was taken from boring (groundwater) while stream water was taken from surface water of Taak Khola.

Table 5-3: Water Quality from the different sites of the project area

SN.	Parameters	Hospital premises (Drinking water)	National Drinking Water Quality Standard,2005	WHO Guidelines for drinking water	Taak Khola (Stream Water)	Criteria for Wastewater discharged from Hospital,2019
1.	Biological Oxygen Demand (BOD)(mg/L)	3.2	-	<5 mg/L	33.3	100
2.	E.coli (CFU/100mL)	**8**	0		TNTC	-
3.	pH	7.66	6.5-8.5		7.52	5.5-9.0
4.	Temperature (°C)	24.78	-		25.76	-
5.	Total Coliform (CFU/100mL)	**368**	0		TNTC	-
6.	Total Suspended Solids(TSS) (mg/L)	2	-		21	100

Note: TNTC= Too Numerous To Count

Compared to the National Drinking Water Quality Standard, 2005, the pH value of drinking water is within the limit, i.e., 7.66. The concentration of E. coli and total coliform present in drinking water are 8 and 368 CFU/100mL respectively, higher than the standard value. Likewise, the temperature and total suspended solids (TSS) of drinking water is found to be 24.78°C and 2mg/L, respectively. According to WHO guidelines, the BOD limit is <5 mg/L for drinking water. However, the observed value of BOD is 3.2mg/L for drinking water, which is within the limit.

Similarly, E. coli and total coliform concentrations are too numerous to count for stream water from Taak Khola. Likewise, the temperature and pH of stream water were found to be 25.76°C and 7.52, respectively. Moreover, the concentrations of BOD and Total Suspended Solids (TSS) were 33.3 mg/L and 21mg/L, respectively. According to the criteria of wastewater discharged from the hospital, 2019, the tolerance limit is 100 mg/L for both BOD and TSS of water. The observed value is extremely lower than the standard value, which meets the tolerance limit.

5.2 Biological Environment

5.2.1 Vegetation

The project area does not contain any endemic or endangered floral species in its territory; however, some grass and bushes species are present in the project construction site. The project area is characterized by a slope with terrace topography. The BP highway passes through the vicinity of the proposed Trauma Center. *Alnus nepalensis* is the dominant vegetation in the site. Some plant species present at the proposed project site are shown in table 5-4.

Table 5-4: Plant species present at the Project site

SN	Common Name	Nepali Name	Scientific Name
1	Chinaberry Tree		*Melia azedarch*
2	Southern silky oak	Kangiyo	*Graviella robusta*
3	Himalayan Ash	Lankuri	*Fraxinus floribunda*
4	Drooping fig	Khanyu	*Ficus semicordata*
5	Alder Tree	Uttis	*Alnus nepalensis*
Bushes species			
	Nepali Name / Common Name		**Scientific Name**
1	Kaalo Kuro		*Bidens pilosa*
2	Yellow Himalayan raspberry		*Rubus ellipticus*
3	Mugwort		*Artemisia vulgaris*
4	Buffalo grass		*Paspalum conjugatum*
5	Gallant soldier		*Galinsoga sp*

Source: Field survey, 2021

5.2.2 Wildlife

5.2.2.1 Mammals

The direct observation of wild mammals was not observed during the field study. However, the sign survey, consultation with locals, and the literature review recorded the presence of 9 wild mammal species (Table 5-5); Golden Jackal (*Canis aureus*), Jungle Cat (*Felis chaus*), Small Indian Civet (*Viverricula indica*), Small Asian Mongoose (*Herpestes javanicus*), Common Leopard (*Panthera pardus*), Large Indian Civet (*Virerra zibetha*), Indian Grey Mongoose (*Herpestes edwarsii*) Yellow-throated Marten (*Martes flavigula*) and Masked Palm Civet (*Paguma larvata*).The listed probable wild mammals in the project site are nationally and globally least concerned, or Near Threatened besides Common Leopard that is nationally vulnerable. Two mammals, Common Leopard (*Panthera pardus*) and Jungle cat (*Felis chaus*) may use the project site as a part of territory, are regulated in the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).

Table 5-5: Probable presence of mammal species at the project site

S.N.	Common Name	Species Name	Conservation Status		CITES	Reference
			Global	National		
1	Golden Jackal	*Canis aureus*	LC	LC		Observed; Photo Evidence
2	Jungle Cat	*Felis Chaus*	LC	LC	II	Indirect observation by pugmark
3	Small Indian Civet	*Viverricula indica*	LC	LC		Observed; Photo Evidence
4	Small Asian Mongoose	*Herpestes javanicus*	LC	LC		Observed; Photo Evidence
5	Common Leopard	*Panthera pardus*	VU	VU	I	Baral and Shah, 2008

6	Large Indian Civet	*Viverra zibetha*	LC	LC		Suwal and Verheugt,1995; Ernst, 2003; Baral and Shah, 2008
7	Indian Grey Mongoose	*Herpestes edwarsii*	LC	LC		Inskip 1988; Corbet and Hill, 1992; Suwal and Verheught, 1995; Santiapilla et al, 2000; Ernst, 2003; Sheikh, 2005; Baral and Shah, 2008
8	Yellow-throated Marten	*Martes Flavigula*	LC	LC		Suwal and Verheugt, 1995; Ernst, 2003; Baral and Shah, 2008; Ghimire, 2010
9	Masked Palm Civet	*Paguma larvata*	LC	LC		Suwal and Verheugt, 1995; Baral and Shah, 2008

Source: Field survey, 2021

5.2.2.2 Avifauna

The proposed Trauma Center is located close to settlement, farmland, and small patches of woods. Hence, the bird species recorded in the area are urban birds, farmland birds, and forest-dwelling birds. A total of 34 bird species, was recorded in the road section (Table 5-6). The most observed birds (21 species) are residents, 12 full migrants and 1 Altitudinal migrant. All birds recorded in the project site are globally and nationally least Concerned and none are on the Protection list of the National Park and Wildlife Conservation Act, 1973. Of 34 recorded bird species, the Black Kite (*Milvus migrans*) is regulated under Appendix-II by CITES. The construction and operation activities of proposed Trauma Centre will not create adverse impact on birds.

Table 5-6: Avifauna recorded at the proposed Trauma Center project site

S.N.	Common Name	Scientific Name	Nepali Name	Conservation Status			CITES	Movement Pattern
				Global	National	NP WC		
1	Ashy Drongo	*Dicrurus leucophaeus*	ध्वाँसेचीबे	LC				Full Migrant
2	Barn Swallow	*Hirundo rustica*	घरगौंथली	LC				Full Migrant
3	Black Drongo	*Dicrurus macrocercus*	कालो चिबे	LC				Resident
4	Black Kite	*Milvus migrans*	कालो चिल	LC			II	Full Migrant
5	Blue Whistling Thrush	*Myophonus caeruleus*	कल्चौडे	LC				Altitudinal Migrant
6	Cattle Egret	*Bubulcus ibis*	बस्तु बकुल्ला	LC				Full Migrant
7	Chestnut-tailed Starling	*Sturnia malabarica*	फुस्रो टाउके सारौं	LC				Resident
8	Common Pigeon	*Columba livia*	मलेवा	LC				Resident
9	Common Myna	*Acridotheres tristis*	डाङ्ग्रे रुपी	LC				Resident

10	Common Tailorbird	*Orthotomus sutorius*	पात सिउने फिस्टो	LC				Resident
11	Eurasian Collared Dove	*Streptopelia decaocto*	कन्ठे ढुकुर	LC				Resident
12	Eurasian Golden Oriole	*Oriolus oriolus*	गाजले सुनचरी	LC				Full Migrant
13	Eurasian Tree Sparrow	*Passer montanus*	रुख भंगेरा	LC				Resident
14	Fulvous-breasted Woodpecker	*Dendrocopos macei*	काष्ठकुट	LC				Resident
15	Great Tit	*Parus major*	चिचिल्को टे	LC				Resident
16	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	चन्चले अर्जुनक	LC				Resident
17	Grey-hooded Warbler	*Phylloscopus xanthoschistos*	तुमलकारे फिस्टो	LC				Resident
18	Himalayan Bulbul	*Pycnonotus leucogenys*	जुल्फे जुरेली	LC				Full Migrant
19	House Sparrow	*Passer domesticus*	घर भंगेरा	LC				Resident
20	Indian White-eye	*Zosterops palpebrosus*	कांकिर	LC				Resident
21	Indian Pond Heron	*Ardeola grayii*	आसकोटे बकुल्ला	LC				Resident
22	Jungle Myna	*Acridotheres fuscus*	बन रुपी	LC				Resident
23	Long-tailed Shrike	*Lanius schach*	भद्राइ	LC				Full Migrant
24	Oriental Magpie-robin	*copsychus saularis*	धोबिनी चरा	LC				Resident
25	Oriental Turtle-dove	*Streptopelia orientalis*	तामे ढुकुर	LC				Full Migrant
26	Pied Bushchat	*Saxicola caprata*	काले झ्याप्सी	LC				Full Migrant
27	Red-rumped Swallow	*Cecropis daurica*	गेरुकटी गौंथली	LC				Full Migrant
28	Red-vented Bulbul	*Pycnonotus cafer*	जुरेली	LC				Resident
29	Red Turtle-Dove	*Streptopelia tranquebarica*	सानो तामे ढुकुर	LC				Full Migrant
30	Rose-ringed Parakeet	*Alexandrinus krameri*	कन्ठे सुगा	LC				Resident

31	Rusty-cheeked Scimitar-babbler	*Erythrogenys erythrogenys*	पाल्कोटे	LC				Resident
32	Western Spotted Dove	*Spilopelia suratensis*	कुर्ले ढुकुर	LC				Full Migrant
33	White-throated Kingfisher	*Halcyon gularis*	सेतो कन्ठे माटीकोरे	LC				Resident
34	Zitting Cisticola	*Cisticola juncidis*	फिरफिरे	LC				Resident

Source: Field survey, 2021

5.2.2.3 Herpetofauna

The natural terrain has been flattened with a complete displacement of the herpetofauna from the proposed Trauma Center. No herpetofauna were observed at the site. However, the Skittering Frog (*Euphlyctis cynophlyctis*) and Indian Bull Frog (*Hoplobactrachus tigrinus*) were observed at the ditches in the proximity and the Common Garden Lizard (*Calotes versicolor versicolor*) at the corn farm. Local informed the presence of the Common Rat Snake in the area. Indian Bull Frog and Common Rat Snake is regulated in Appendix-II in CITES.

Table 5-7: Herpetofaunal species present at project site

S.N.	Common Name	Species Name	Conservation Status		CITES	National Protection Status	Reference
			Global	National			
1	Skittering frog	*Euphlyctis cynoplyctis*	LC				Observed; Photo Evidence
2	Indian bull frog	*Hoplobactrachus tigerinus*	LC		II		Observed; Photo Evidence
3	Common garden lizard	*Calotes versicolor versicolor*	Not assessed				Photo evidence
4	Common rat snake	*Ptyas mucosa*	Not assessed		II		Local consultation

Source: Field survey, 2021

5.2.2.4 Butterfly

Twelve butterfly species were observed during the field visits to the proposed Trauma Center project site. Observed species of butterflies in the project area have not been assessed for IUCN Red List for the threatened category; Nationally Threatened category CITES and Protection list in Nepal.

Table 5-8: Butterfly species present at the project site

S.N.	Common Name	Scientific Name	Conservation Status			CITES
			Global	National	NPWC	
1	Indian Common Crow	*Euploea core core*	Not assessed			
2	Common Four-ring	*Ypthima huebneri*	Not assessed			

3	Oriental Common Grass yellow	*Eurema hecabe hecabe*	Not assessed			
4	Common Jester	*Symbrenthia lilaea*	Not assessed			
5	Indian Common Mormon	*Papilio polytes*	Not assessed			
6	Common Sailer	*Neptis hylas*	Not assessed			
7	Fulvous Pied Flat	*Pseudocoladenia dan*	Not assessed			
8	Dark Clouded Yellow	*Colias fieldii*	Not assessed			
9	Indian Tortoiseshell	*Aglias caschmirensis*	Not assessed			
10	Metallic Cerulean	*Jamides alecto*	Not assessed			
11	Newar Three-ring	*Ypthima newara*	Not assessed			
12	Pea Blue	*lampides boeticus*	Not assessed			

Source: Field survey, 2021

5.3 Socio-economic and cultural Environment

5.3.1 Demography

According to the CBS, 2021, the total population of Kavrepalanchowk district, Dhulikhel municipality and its ward number 6 is presented in Table 5-9

Table 5-9: Demographic characteristics of the project affected municipality and ward

District/Municipality/ Ward	HHs	Population			Average HHs Size
		Total	Male	Female	
Kavrepalanchowk	93189	366879	180967	185912	3.94
Dhulikhel Municipality	8808	36,183	18501	17682	4.10
Ward number 6	519	2125	1048	1077	4.09

Source: CBS, 2021

5.3.2 Caste and Ethnic Composition

According to the Municipality Profile of Dhulikhel Municipality, 2016, Newar (31.69%) is the dominant caste of project affected municipality followed by Tamang (15.48%), Chhetree (14.33%), Brahmin-Hill (10.55%) etc. The caste and ethnic composition of the project affected municipality is presented in Table 5-10.

Table 5-10: Caste and Ethnic composition of the project affected municipality

S.N	Caste	Dhulikhel municipality	
		Population	Percentage
1	Newar	7855	31.69
2	Tamang	3837	15.48
3	Brahmin-Hill	2615	10.55
4	Chhetree	3553	14.33
5	Magar	1617	6.52
6	Kami	1072	4.32

7	Damai	1010	4.07
8	Rai	935	3.77
9	Saarki	381	1.53
10	Other	1908	7.69

Source: Municipality Profile of Dhulikhel Municipality, 2016

5.3.3 Religion

According to the Municipality Profile of Dhulikhel Municipality, 2016, Hindu (31.69%) is the dominant religion of project affected municipality followed by Baudha (15.48%), Christian (14.33%), Shikh (10.55%) etc. The religion composition of the project affected municipality is presented in Table 5-11.

Table 5-11: Religion composition of project affected municipality

S.N	Religion	Dhulikhel municipality	
		Population	Percentage
1	Hindu	13200	53.26
2	Baudha	9214	37.17
3	Christian	1505	6.07
4	Muslim	70	0.20
5	Shikh	121	0.48
6	Others	670	2.70

Source: Municipality Profile of Dhulikhel Municipality, 2016

5.3.4 Education

According to the Municipality Profile of Dhulikhel Municipality, 2016, the total literacy rate of Dhulikhel municipality is 79.42%. The literacy status of the project affected municipality is presented in Table 5-12.

Table 5-12: Literacy status of project affected municipality

Dhulikhel municipality	Population who				Literacy rate
	Can read and write	Can read only	Can't read and write	Total	
Total	21,088	2584	1111	24783	79.42
Percentage	85.09	10.42	18.02	4.48	

Source: Municipality Profile of Dhulikhel Municipality, 2016

Dhulikhel municipality has educational institutions from primary level to higher level. In addition, Kathmandu University is located near to project-affected area, which is at distance of 1.8 km. Similarly, Purna Sanjivani Lankhnamai secondary school and Bhairav secondary school are situated close to project-affected site within a distance of 500 m. and 700 m. respectively.

5.3.5 Health and sanitation

Dhulikhel Hospital is the primary Health Center of the Kavrepalanchowk district, which is located at the west direction of the project area. Besides, center few polyclinics and health centers are noticed in project areas. The primary health problems associated with local people are common cold, typhoid, diarrhea, respiratory diseases, gastrointestinal diseases,

malnutrition, water-borne diseases, and many others. In context with the status of sanitation in Municipality, most households have flush toilets as well as ordinary toilets.

5.3.6 Physical Infrastructures

Telephone lines have already been distributed in Dhulikhel municipality, and more are in progress. Mobile phones and internet services users are increasing day by day. The project site is connected with every form of communication service, and hospitals themselves have telephone lines with 24 hr. internet facilities. Number of radio stations, print magazines, and courier services are also available in the city. Almost all the residents near the hospital area are connected to the electricity line. During load shedding/electricity scarcity, backup facilities such as inverters, UPS, and generators are used.

5.3.7 Economy

The main occupation of Dhulikhel Municipality people is Agriculture (40.88%), Business (30.90%), labor (4.27%), government and nongovernment organization work (17.86%), and small industry (8.24%).

5.3.8 Demography of Project affected area (Direct impact area)

5.3.8.1 Demography

According to the field survey, the total population of direct impact zone within distance of 500 m from project location is 3,334 and the number of total households is 822. Detail of the demographic characteristics of direct impact zone is presented in Table 5-13.

Table 5-13: Demographic characteristics of Direct Impact Zone (500m periphery from project location)

Direct Impact Zone	HHs	Population			Average HHs Size	Sex Ratio
		Total	Male	Female		
500m periphery from project location	822	3,334	1,619	1,715	4.05	94.40

Source: Field Survey, 2021

5.3.8.2 Caste and Ethnic Composition

According to the field survey, the major ethnic group of direct impact zone is Newar (23.48%) followed by Tamang (17.51%), Brahmin-Hill (12.92%), Kshetree (12.14%), etc. The caste and ethnic composition of the direct impact zone is presented in Table 5-14.

Table 5-14: Caste and Ethnicity of Direct Impact Zone (500m periphery from project location)

S.N.	Caste	500 m periphery from project location	
		Population	Percentage
1	Newar	783	23.48
2	Tamang	584	17.51
3	Brahmin-Hill	431	12.92
4	Kshetree	405	12.14

5	Magar	217	6.50
6	Kami	86	2.57
7	Sarki	95	2.84
8	Damai	76	2.27
9	Thakuri	98	2.93
10	Rai	64	1.91
11	Other	495	14.84

Source: Field Survey, 2021

5.3.8.3 Education

According to the field survey, among the total population of 3334, population aged 5 years and above is 2145. Among 2145 people, 1732 people can read as well as write, 376 people can only read, 21 people can't read and write. The total literacy rate of direct impact zone is found to be 80.74%. The literacy status of direct impact zone is presented in Table 5-15.

Table 5-15: Literacy status of Direct Impact Zone (500m periphery from project location)

500m periphery from project location	Population aged 5 years and above	Population who				Literacy rate
		Can read and write	Can read only	Can't read and write	Not stated	
Total	2145	1732	376	21	16	80.74
Percentage		80.74	17.52	0.97	0.74	

Source: Field Survey, 2021

5.3.9 Cultural Environment

The main temples/ gumbas located nearby project area are Bhagwati temple, Harisiddhi temple, Brahmayani temple, Buddha stupa, etc. The distance of the religious site from the project area is presented in Table 5-16. The religious sites are far from project area so no impact will be occurred due to construction of project.

Plate 5-3: Religious place near the project area

Table 5-16: Religious site and its distance from the project area

Direction from project	Religious site	Distance from the project area
North-East	Bhagwati Temple	500 m
East	Harisiddhi Temple	600 m

East	Brahmayani Temple	650 m
East	Buddha Stupa	600 m
East	Balkumari Temple	600 m
West	Aakash Devi Temple	1.5 km

Source: Field study, 2021

5.3.10 Cultural Rituals

The majority of people from project area celebrate festivals like Dashain, Tihar, Maghe Sankranti, Janai Purnima, Dhany Purnima, New Year, etc.

CHAPTER 6 : ALTERNATIVE ANALYSIS OF THE PROPOSAL

Nepal has emphasized ensuring universal access to the health related fundamental rights and quality health care of the Nepali citizens as provided by the constitution through the health system in accordance with the federal structure. In line with the concept of universal access to health, there is a strategy to develop and expand promotional, remedial, therapeutic, rehabilitation, and administrative services in an integrated manner. The comparison of various considered project alternatives showed that the project would not cause severe adverse environmental impacts if appropriate mitigation and monitoring measures identified are implemented in the project design and implementation. Therefore, to support the government's objectives of increasing health service facilities in the nation, the proponent has decided to implement the proposal. Non-Implementation of this alternative will avert the project, due to which the country steps back in the improvement of health and education sectors. This will cut off all opportunities for trauma health services in the project area and affect the production of a significant number of qualified and skilled personnel in the field of health care services.

For that reason, this option has been studied within the concept of implementing the proposal. While implementing the proposal, the options, including the following areas, have been analyzed.

a) Design
b) Project Location
c) Technology, Procedure of Operation, Time Schedule
d) Raw Materials to be used
e) Environmental Management Plan

Beneficial and Adverse impacts in the environment due to implementation of alternative analysis are explained in table no 6-1.

Table 6-1: Alternative analysis of Project

Alternative	Analysis	Beneficial Environmental Impacts	Adverse Environmental Impacts
Design	The design and drawings approved by Dhulikhel Municipality will adopt, and the building of the hospital will be constructed according to law	Trauma health services will provide to people, and trauma patients will get treatment within a short time.	• Population growth in a particular area.
Project Location	Dhulikhel Hospital Trauma and Emergency Center will be located at Ward no.6 of Dhulikhel Municipality in Kavrepalanchowk District, Nepal. Realizing the need of trauma center in Kavrepalanchowk district and to provide quality trauma health service	Trauma health services will be provided to patients quickly	• Population growth in a particular area. • Traffic congestion

	for the patients, Dhulikhel Hospital proposed the project. Regarding location, two sites (Site A and Site B) were compared. Site A is direct access from B.P. Highway (Sindhuli road) whereas site B is indirect access with narrow and sloppy road and 550 m south from B.P. Highway.		
Land use	The land use of the project site is grassland without any cultivation. Surrounding land of the project areas is residential/ BP highway, unused slope land is covered with grass and secondary forest.	Access to trauma health service to the entire district	• Open space decrease • Change in Land use pattern
Procedure of Operation	The project construction will start from 2023 AD, and the construction works will be operated at day time as far as possible	• Health services access to local people • Employment Opportunity to Local people	• Disturbance on Environment
Time Schedule	The construction work will be completed within 2 years	• Employment Opportunity to Local people	• There are possibilities of Noise and Air Pollution during the construction period
Technology adopted	• This hospital is aimed at providing medical services using the Best Available Technology (BAT). • The hospital will gradually follow up on new and modernized technology regarding diagnosis. • The trauma center will use mercury-free equipment. • Instead of using mercury associated thermometers and Sphygmomanometers, digital thermometers, and mercury free sphygmomanometers, trauma center hospital will be mercury free.	Access to health Care facilities	No
Raw Materials to be used	• Construction materials such as sand, gravel, and cement will be sourced from the local market.	Increase in economic activities of local market	No

	• Environmental friendly construction materials will be used		
Use of Forest and Government Land	• No forest land will be used • Use of private and barren land (lease land)	Access to Health Care facilities	lack of open space
Environmental Management Plan	• Health care waste will be treated by using an autoclave before transport to the disposal area • The pathological wastes like body part, tissue will be disposed in bio pit. • Expired medicines will be returned back to the production company, and only mercury free equipment will be used. • The radiological waste will be stored in a close room with applying safety measures, and Training related to occupational health safety will be provided to the health worker of the hospital • Wastewater generated from the hospital will be treated by reed bed wastewater treatment plant. • Solar energy will be used as alternative energy sources. • Recharge pit will be constructed for groundwater recharge. • Rainwater harvesting technology will be adopted.	Help to maintain a clean environment	No

Alternative Analysis of the Project Location

In the environmental alternative analysis of the facility location, the nearest two locations (A and B) have been selected. The results of the environmental alternatives analysis are shown in the table below. Although "Location A" requires land acquisition, other safety (accidents), convenience of public infrastructure, and less impact on land stability and flooding conditions, therefore, Location A is recommendable than Location B.

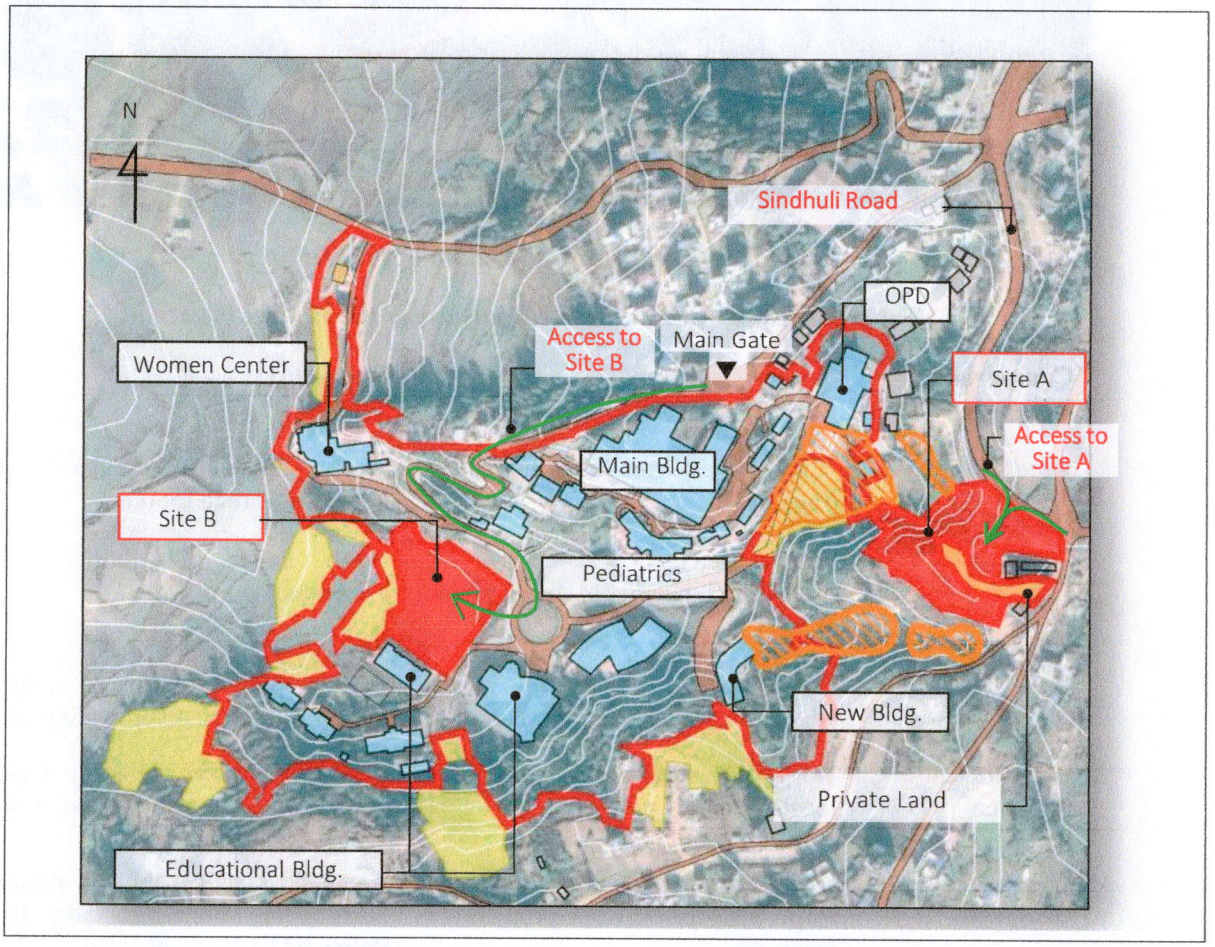


Figure 6-1: Alternative Analysis with respect to location

Figure 6-2: Alternative location of Project area

Table 6-2: Result of Alternative Analysis for the Project Location

Comparison Item	Site – A	Site – B
Accessibility	Direct Access from the trunk road (0m)	Access indirect through narrow and sharp angle road (550m)
Land Use	Mainly open land (Lease and purchased from private owner)	Open land but utilized for emergency purpose
Ecosystem	Few impacts due to no natural vegetation (abandoned farmland)	Few impact due to no natural vegetation (Helicopter landing area)
Hydrological Situation	Not flooding area because this area is located on the top of hill	Flooding area in the rainy season because this area is located in low land
Topography and Geography	Since this area is located edge of slope, appropriate slope protection is necessary	The land is not stabilized because surrounding buildings have been damaged by land upheaval
Land Acquisition and Resettlement	Land acquisition and 2 households resettlements are caused	There are not any land acquisition nor resettlements
Public Infrastructure and Services	Possible to access from Sindhuli directly	Impossible to access from Sindhuli Road. App. 500m connected road from Sindhuli Road is very narrow and tight curves
Traffic Accident and Safety	Traffic accidents are not caused on the connected road due to direct	It is expected traffic accidents may be caused on the connected road

	connection from trunk road (Sindhuli Road)	because 500m narrow with tight curves road
Comprehensive Evaluation	Although some land acquisition are necessary, "Location-A" is recommended because the location is directly accessible from the trunk road and the convenience of public infrastructure is high.	Although land acquisition are not necessary, it is evaluated that the location-B is easily affected by floods, and the land is not stabilized from the view of topography and geology. Furthermore the connecting road from the trunk road (Sindhuli Road) is narrow and not safe from the view of traffic accident
Conclusion	Selected	Not selected

No Project Option

If this project is not implemented, it is expected that the capacity to respond to emergency patients will be limited, or that it will take time to transfer patients to other hospitals, reducing the survival rate. Non implementation of this project will also avert the project due to which the country steps back in the improvement of health and education sectors. This will cut off all opportunities of health services in the project running area and affect the production of a significant number of qualified and skilled personnel in the field of health care services.

The comparison of various considered project alternatives showed that the project will not have severe adverse environmental impacts if appropriate mitigation and monitoring measures identified are implemented during project design and implementation phase. Therefore, to support the government's goals of improving health service facilities in the nation; the proponent has decided to implement the proposal.

CHAPTER 7 : IMPACT ON THE ENVIRONMENT WHILE IMPLEMENTING THE PROPOSAL AND PROTECTION MEASURES

This chapter identifies the potential environmental impacts associated with the project activities. All the environmental impacts that have been predicted during the Scoping stage and identified in EIA stage has been categorically analyzed and assessed based on existing conditions. The beneficial and adverse impacts due to implementation of the project are discussed for project construction and operation phase.

7.1 Beneficial Environmental Impacts

7.1.1 Construction Phase

7.1.1.1 Employment opportunity

During the construction of the trauma center, skilled, semi-skilled, or unskilled human resources will get employment opportunities. Approximately 70 skilled and unskilled persons will be involved in project during construction work. Priority will be given to local people for the job opportunity. *The envisaged impact is direct in nature, high in magnitude, local in extent, and short term in duration; hence, this impact is very significant.*

7.1.1.2 Increase in economic activities

Different type of construction materials and equipment will be required during the construction phase. Suppliers of local markets will get an opportunity to supply construction materials like cement, steel, bar, gravel, sand, etc. This will benefit the local market and help grow the local people's economy. *The envisaged impact is direct in nature, medium in magnitude, local in extent, and short term in duration; hence this impact significant.*

7.1.1.3 Technical skill enhancement

The project development involves competent human resources like engineers, painters, carpenters, sanitary fixers, welders, electricians, etc. It will be a better opportunity for them to develop skills and learn new technologies. The workforce gets the opportunity to work with new technologies and equipment so that their skill level will upgrade. This will be a positive point to the employees for their future works. Idea and skill generated for once can be used for similar nature of projects in future. *The envisaged impact is direct in nature, medium in magnitude, local in extent, long term in duration; hence, this impact is significant.*

7.1.2 Operation Phase

7.1.2.1 Increase in the local economy

With the operation of the trauma center, economic activities will be increased around the hospital. Daily activities of the area will be increased, and demand for local goods, markets, food, and other basic requirements will be increased at the project site. A large number of visitors, patients, and other staff will significantly increase economic transactions in and around the project area. This will increase the local economy, lead to the urbanization of the area, and improve the local people's socio-economic status. With the operation of the hospital, the trade and business activities may increase significantly around the hospital

area; more medical stores, groceries, or commodity stories will start their business. The number of suppliers supplying various hospital related items and other different commodities would be increased. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence, this impact is significant.*

7.1.2.2 Health care services opportunities for local people and outsiders

Health care services will be accessible to local people on their door, and a number of medical doctors, nurses, pharmacists, lab technicians, radiologists, physiotherapists, etc., will be given their services through the hospital every day. To enhance the health services to local people, occasional free health camps will be organized by the hospital locally in coordination with local people. Beside this, public awareness programs related to accident will be conducted in an interval of time. *The envisaged impact is direct in nature, high in magnitude, regional in extent, long term in duration; hence, this impact is very significant.*

7.1.2.3 Employment opportunity for locals

Currently, most of the employees are from the local area in Dhulikhel Hospital. The proponent will continue this trend of employing locals in the proposed trauma center also. The direct employment during the operation of the hospital has been estimated to be 210, including technical and non-technical staff. To enhance the employment opportunities, local people whose land will be acquired by the trauma center will be given priority based on their qualifications and experiences. During the operation phase, the trauma center will provide job opportunities to skilled, semi-skilled, and workers. The part of the labor force will be recruited locally based on qualifications and experiences. *The envisaged impact is direct in nature, high in magnitude, local in extent, long term in duration; hence, this impact is very significant.*

7.1.2.4 Increment of land value

The area near the project will be of very high significance because the land near project will be used to establish offices, shops, and restaurants, serving the increased number of people who do business in the Dhulikhel Hospital Trauma and Emergency Center. This activity will likely uplift the economic condition of the local people. Measures to enhance benefit would be to promote land development activities and control of encroachment within the project area. *The impact is direct, high in magnitude, local in extent, long term in duration; hence, this impact is very significant.*

7.1.2.5 Discount facility to local people and free treatment to needy, helpless patients and senior citizens

The trauma center will provide discount facilities to the local people and will allocate 10% of total beds for needy and helpless patients with free treatment and special facilities with required beds for elderly patients. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration hence significant.*

7.1.2.6 Emergency health care service for trauma patients

The proposed Trauma and Emergency Center will provide patient-centric timely treatment for all types of trauma victims. A well-functioning Dhulikhel Hospital Trauma and Emergency Center care system reduces the likelihood of death and permanent disability. This trauma center will be part of that system, work toward resuscitation, treatment, and rehabilitation care of all such patients. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence, this impact is significant.*

7.1.3 Evaluation of Beneficial Impact

These impacts have been evaluated to determine their environmental significance considering the location of the project, direct or indirect nature, reversibility and irreversibility of the impacts. The significance of the impacts has been evaluated as very significant, significant, and insignificant. Impact having a total score of over 75 above is considered very significant; less than 75 and up to 45 score is considered as significant, and less than 45 is considered insignificant for the project.

Table 7-1: Evaluation of Beneficial Impact

Issues	Impacts	Environmental Impacts				Total Score	Significance of impacts
		Nature	Magnitude	Extent	Duration		
Construction Phase							
Employment opportunity	Skilled, semi-skilled, or unskilled human resources will get employment opportunities. Approximately 70 human resources will be involved in project construction work. Priority will be given to local people for job opportunities.	D	H(60)	Lo (20)	ST(05)	85	Very Significant
Increase in economic activities	Suppliers of local markets will get an opportunity to supply construction materials like cement, steel, bar, gravel, sand, etc. This benefits the local market and helps to increase the economy of the local people.	D	M(20)	L o(20)	ST (05)	45	Significant
Technical skill enhancement	Better opportunity for them to develop skills and to learn new technologies. The workforce gets the opportunity to work with new technologies and equipment so that their skill level will enhance. This will be a positive point to the employees for their future works. Idea and skill generated for once can be used for similar nature of projects in future.	D	M (20)	Lo(20)	ST(05)	45	Significant
Operation Phase							
Increase in the local economy	With the operation of the Hospital, there will be an increase in the economic activities of the local people.	D	M (20)	Lo(20)	LT(20)	60	Significant
Health care opportunities for trauma patients from local people and outsiders	Health facilities will be accessible for the local people as well as for the people from the surrounding district and nearby settlement	D	H(60)	R(60)	LT(20)	140	Very Significant

Issues	Impacts	Environmental Impacts				Total Score	Significance of impacts
		Nature	Magnitude	Extent	Duration		
Employment opportunity to local people	Large numbers of medical professionals and other staff are involved in running the hospital and providing the medical services to the trauma patient.	D	H(60)	Lo (20)	LT(20)	100	Very Significant
Increment of Land value	The area near the project will be of very high significance because the land near the project can be used to establish offices, shops, and restaurants which will serve the increased number of people who do business in the Dhulikhel Hospital Trauma and Emergency Center	D	H(60)	Lo (20)	LT(20)	100	Very Significant
Discount facility to local people and free treatment to needy, helpless patient	Trauma center will provide discount facilities to the local people and will allocate 10% of total beds and health services for needy, helpless patients with free treatment and special facilities with required beds for elderly patients.	D	M(20)	Lo(20)	LT(20)	60	Significant
Emergency health Care Service for Trauma Patient	Dhulikhel Hospital Trauma and Emergency Center care system reduces the likelihood of death and permanent disability. This trauma center will, as a part of that system, works towards resuscitation, treatment, and rehabilitation care of all such patients.	D	M(20)	Lo(20)	LT(20)	60	Significant

7.2 Adverse Environmental Impacts

7.2.1 Construction Phase

7.2.1.1 Physical and Chemical Environment

7.2.1.1.1 Impact due to construction waste

Construction activities can generate different types of construction wastes. Construction waste includes debris, broken brick pieces, left out/non-usable reinforcement bars, sand, stone, waste cement, sand mix and packing materials. If construction waste is not appropriately managed can cause problems to the local environment. The construction work will also generate the spoil. The haphazard disposal of spoil can cause the possibility of accidents. *The envisaged impact is direct in nature, high in magnitude, site specific in extent, short term in duration; hence, this impact is significant.*

7.2.1.1.2 Impact due to air pollution

Activities like site clearance use of heavy vehicles and machinery will significantly contribute to air pollution. Moreover, transporting construction materials such as sand, cement, and brick to the construction site causes air pollution by generating particulates and toxic gases like CO, SO_2, NO_2, etc. These activities may give a few impacts to the project personnel and nearby residents. Besides this vehicular movement on the side road, operation of construction machinery/ equipment including back-up diesel generator (DG) sets, construction-related activities, spoil disposal, etc., emits dust leading to deterioration in air quality. *The envisaged impact is direct in nature, high in magnitude, local in extent, short term in duration; hence, this impact is significant.*

7.2.1.1.3 Impact due to soil contamination

Soil pollution is likely to occur due to earth work such as transportation of cutting land and the accumulation of solid waste during the project construction phase composed of debris containing bits of wood, bricks, stone, and metal pieces, replaced machinery parts, plastics, broken glass, and ceramics. The waste may also contain hazardous lead-based paint residues, paints and solvents, cement, diesel fuel, oil, heavy metals, and other products considered hazardous waste material. This hazardous waste plays a vital role in degrading the soil quality. *The envisaged impact is direct in nature; moderate in magnitude, site specific in extent, short term in duration; hence this impact insignificant.*

7.2.1.1.4 Impact due to noise pollution

Noise is one of the most undesirable consequences of construction activity due to equipment, including generators, vehicles, etc. The most commonly reported impacts of increased noise levels are interference in oral communication and disturbance in sleep. During the project construction stage, the noise levels at the project site and adjacent areas would higher than those usually occurring in the project area. The project construction activities involving the operation of heavy equipment for ground preparation, use of generators, construction of building structure, and movement of heavy machinery during the transportation of construction materials and medical equipment will cause temporary increase of noise levels in the project site. *The envisaged impact is direct in nature, high in magnitude, site specific in extent, short term in duration; hence, this impact is significant.*

7.2.1.1.5 Impact due to water pollution

Water is required in large quantities during construction works, such as, during compaction of the soil, during water spraying to control dust, during mixing of cement concrete and mortar, curing of concrete, cement plaster, cleaning of surfaces, etc. There is a possibility of water pollution due to mixing of wastewater discharge from construction site that leads to pollution of river near the project site. *The envisaged impact is indirect in nature, moderate in magnitude, site specific in extent, short term in duration; hence, this impact is insignificant.*

7.2.1.1.6 Impact due to land vibration

The land vibration impact is generated during the soil compaction activity; vibration impacts to the settlement are expected to be within tolerable limits. There are pile-driving activities, so vibration is generated from piling and vibrator equipment during soil compaction. *The envisaged impact is direct in nature, low in magnitude, site specific in extent, short term in duration; hence, this impact is insignificant.*

7.2.1.1.7 Impact due to groundwater extraction

A high amount of water will be required for the project's construction, which will be extracted from underground. If the withdrawal rate exceeds the recharge rate, there will be a chance of groundwater depletion in the surrounding area. Besides this, activities like the construction of buildings or pavement of surfaces will further decrease the permeable surface, thereby lowering the recharge rate. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, short term in duration; hence, this impact is significant.*

7.2.1.1.8 Impact due to stockpiling of construction material

Construction materials such as soil, gravel, sand, aggregates, etc., or excess material are usually stockpiled within the construction site or other related facilities of sub-contractor. This may lead to blowing away of the dust particles. Heavy rain can also wash away finer particles and pollute surface water. *The envisaged impact is indirect in nature, low in magnitude, site specific in extent, short term in duration; hence, this impact is insignificant.*

7.2.1.1.9 Impact on Topography and geology (landslide/corruption of project area and embankment)

The proposed site is located in the barren land, but there is a probability of landslide of land adjacent to Rajkulo. *The envisaged impact is direct in nature, moderate in magnitude, site specific in extent, long term in duration; hence, this impact is significant.*

7.2.1.2 Biological Environment

7.2.1.2.1 Impact on urban biodiversity/ ecosystem

Since the project and surrounding area is developed as farmland and residential area, recorded species are common species. However leaking of hazardous material and wastes may give adverse impacts on such urbanized fauna and flora species. Additionally some secondly tress might be cut in the west side of project area. *The envisaged impact is direct*

in nature, low in magnitude, site specific in extent, short term in duration; hence this impact is insignificant.

7.2.1.3 Socio-economic and cultural Environment

7.2.1.3.1 Child labor and discrimination towards women labor

During the construction phase, contractors may exploit children and women to work as labor for their benefit. They may be involved in heavy and risky work at a lower salary than the eligibility and male workers. In addition, as per conversation with labor, the difference in male and female wage is predominant here. This implies the possibility of discrimination in the wage of male and females in the future too. This kind of illegal activity of going against the law should be given high attention. *The envisaged impact is direct in nature, low in magnitude, local in extent, short term in duration; hence, this impact is insignificant.*

7.2.1.3.2 Impact due to occupational health and safety

As labor forces are required to undertake various types of works, from hazardous materials handling, heavy equipment operations, transporting and translocation of heavy construction materials, etc., they will be prone to various risks and health hazards. Prolonged exposure to smoke and dust pose health problems such as respiratory problems and eye diseases. Similarly, skin burning, hand and foot cement-bitten, and bitumen works are also possible among workers. Accidents due to vehicular impact during pavement construction work, and fall from height during the erection of steel truss structures are possible. Fire hazard is also present at material and fuel storage sites. *The envisaged impact is direct in nature, high in magnitude, site specific in extent, short term in duration; hence, his impact is significant.*

7.2.1.3.3 Impact due to conflict between workers and local people

Contractors tend to employ a set of labors that have worked with them in the past and been trained by them and have confidence that they will work as per their schedule, rules, benefits, etc. The locally available labors may not be sufficient or trained properly, so the contractors tend to employ workers from outside the project area. This, in turn, may cause conflicts between outside workers and local people. Conflicts may rise due to the outside workers' in sensitivities towards the local customs, norms, and religion, harassments, alcoholism, prostitution, the spread of STDs, sharing of resources like firewood or drinking water, etc. *The envisaged impact is direct in nature, low in magnitude, site specific in extent, short term in duration; hence, this impact is insignificant.*

7.2.1.3.4 Impact due to traffic congestion

Along with the construction of the hospital, the influx of people from distant and moving in and out of the hospital construction site will be increased. As the number of vehicles will be increased this may contribute to traffic congestion due to lack of proper parking area. Such situation may cause accidents. *The envisaged impact is direct in nature, high in magnitude, site specific in extent, short term in duration; thus, this impact is significant.*

7.2.1.3.5 Impact due to influx of people in the project site

The influx of workers in the project site can lead to adverse social and environmental impacts on local communities. Such adverse impacts may include increased demand and

competition for local social and health services, as well as for goods and services. This can lead to price hikes and crowding out of local consumers, increased volume of traffic and higher risk of accidents, increased demands on the ecosystem and natural resources, social conflicts within and between communities, increased risk of spread of communicable diseases, and increased rates of illicit behavior and crime. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, short term in duration; hence this impact is significant*

7.2.2 Operation Phase

7.2.2.1 Physical and Chemical Environment

7.2.2.1.1 Impact due to hospital waste generation

Medical activities will be live saving, however, while doing patient care, health care waste might be generated that could be hazardous, toxic and even lethal if not handled properly. The hazardous and toxic parts of waste from the hospital complex comprised infectious, biomedical, human tissues and radioactive material and sharps (needles, knives, scalpels, etc.). They constitute a serious risk to public health and the environment if not managed properly. The hospital will also generate different types of chemical wastes and heavy metal waste. If these infectious, chemical wastes and heavy metal waste are not properly managed can cause severe problems in the local area. *The envisaged impact is direct in nature, high in magnitude, local in extent, long term in duration; hence this impact is very significant.*

7.2.2.1.2 Impact due to waste water generation

The waste water generated from pathological laboratories, Operation Theater, X-ray department, hospital ward, toilet, and disinfection and cleaning during the hospital's operation will be hazardous if not treated properly. *The envisaged impact is direct in nature, high in magnitude, site specific in extent, long term in duration; hence this impact is very significant.*

7.2.2.1.3 Impact due to air pollution

The primary source of air pollution will become out from the operation of the generators. Operation of generator will be required during load shedding period only. Besides this, vehicular emissions may give a few impacts to air pollution. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence this impact is significant.*

7.2.2.1.4 Impact due to soil pollution from wastes

Different types of chemical wastes are contaminated waste water are generated by the hospital. If these infectious, chemical wastes are not properly managed, that will cause severe problems in cultivated land and soil. *The envisaged impact is direct in nature, high in magnitude, local in extent, and long term in duration; hence this impact is very significant.*

7.2.2.1.5 Impact due to noise pollution

The main source of the noise during hospital operation will be the movement of vehicles and operation of the generators. After completion of the hospital, the inflow of people will comparatively increase in the area. However this degree of impacts are not serious because some patients are coming from current Dhulikhel hospital and total traffic volume in the area does not increase drastically. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration, hence this impact is significant.*

7.2.2.1.6 Impact due to water pollution

Hospital waste water contains hazardous pharmaceuticals and can cause serious infectious diseases. Sewage coming from the hospital is cause of water pollution, and wastewater from the radiological laboratory, the pathological laboratory, and laundry are also a major polluter - giving rise to contamination with heavy metals in surface water. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence this impact is significant.*

7.2.2.1.7 Energy fulfillment for the hospital operation issues

Almost all the residents near the hospital area are connected to the electricity line. Due to load shedding/electricity scarcity backup facilities of Inverters, UPS and Generators were also observed. During the operation phase, the hospital sometimes takes a high load of current and electricity, which can causes load shedding problems in the project-affected area. *The envisaged impact is direct in nature, low in magnitude, site specific in extent, long term in duration; thus, this impact is insignificant.*

7.2.2.1.8 Lowering water table due to extraction of groundwater and effect on adjoining source

The aquifer for the water source of the well is within weathered zone in this area. This is different from the horizontally spreading sedimentary layer, which often forms an aquifer with a shape close to vertical. Therefore, it is not likely to give adverse impacts on the surrounding wells and underground table. *The envisaged impact is direct in nature, moderate in magnitude, site specific in extent, long term in duration; hence, this impact is significant.*

7.2.2.1.9 Disaster risk reduction (Earthquake, fire hazards, lighting, electrocution) in hospital

A multi-story building poses a high risk of hazards like earthquakes, fires, lightning, etc. The possibility of losing lives and properties is higher due to a large project structures. Thus, disaster mitigation and preparedness hold a high significance. Earthquake and fire safety been the proponent's prime concern for the disaster management. The proponent will design procedures to identify potential emergency conditions and response to the disaster. Hospital buildings will be designed as earthquake resistant and maintain emergency safety instruments and alarms in the buildings. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence, this impact is significant.*

7.2.2.1.10 Radiation hazard from radiological equipment

The hospital will have two units, namely Radio diagnosis and Radiotherapy, where the radioactive substance may be used. The use of radioactive substances will generate radioactive waste. This radioactive waste needs to be adequately managed. The radiation effect from these radioactive wastes can be far more devastating than other pollution. This type of waste has properties of carcinogenicity, mutagenicity, and teratogenicity. This waste needs to handle with precautions. *The envisaged impact is direct in nature, high in magnitude, site specific in extent, and long term in duration; hence significant.*

7.2.2.2 Biological Environment

7.2.2.2.1 Impact on urban biodiversity

The haphazard disposal of solid waste and wastewater generated from the hospital may cause adverse effects on avifauna (crow, sparrow, etc.) of the local surrounding. However, it is not likely to give any adverse impacts on biodiversity, if appropriate waste management are carried out. *The envisaged impact is direct in nature, low in magnitude, local in extent, long term in duration hence significant.*

7.2.2.3 Socio-economic and cultural Environment

7.2.2.3.1 Health and sanitation in and around the hospital

The hospital will generate medical waste (used cotton and bandages, tested medical specimens, expired drugs, used syringes and needles, human waste etc.). If these wastes are not properly segregated and disposed of, it may create a risk to hospital visitors and nearby settlements. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence, this impact is significant.*

7.2.2.3.2 Food safety issues for patients, visitors and staff

Food sanitation of canteen is a very important factor for the hospital. Unhygienic food and sanitation might cause different health problems. Food might be infected in many ways and could cause problems to visitors. *The envisaged impact is direct in nature, moderate in magnitude, site specific in extent, long term in duration; hence significant.*

7.2.2.3.3 Hospital management issues

The hospital management committee will be determined to provide effective health care services to the patients. Slight mistakes of health staff can lead to a huge conflict. Problems related to service management such as quality health care facilities, hospital waste, staff management will arise if a proper management plan will not be prepared. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration hence significant.*

7.2.2.3.4 Grievances management

With project operation, a relative increase in the population increases the demand for basic needs like food, drinking water, security, energy, etc. There may be a shortage of these essential things to feed the large population. The hospital management committee is likely to receive grievances from the local community during the operation phase. Different discussions and confusions may arise during the operation of the hospital. Complaints

related to impacts, demands, services, financial support for the community development are the primary concern of grievance management. Moreover, an increase in the population density of the site may lead to different social or cultural disputes among them. Locals nearby the hospital also demand free health check services and discounts on different health check facilities to the locals. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration hence significant.*

7.2.2.3.5 Law and order situation

The hospital management committee is likely to receive grievances from the local community during the operation phase. Different discussions and confusions may arise during the operation of the hospital. Complaints related to impacts, demands, services, financial support for the community development are the primary concern of grievance management. *The envisaged impact is direct in nature, low in magnitude, local in extent, and short- term in duration, hence this impact is insignificant.*

7.2.2.3.6 Impact due to haphazard market growth

Population growth in the area will increase the consumption of goods and services. This will stimulate the local business and expansion of the market in the project periphery. The haphazard market growth will cause disturbance in people mobility, which will make the hospital area more crowded. *The envisaged impact is indirect in nature, low in magnitude, local in extent, and long term in duration; hence this impact is significant.*

7.2.2.3.7 Public services and facilities

Hospital management committees should be determined to provide effective health care services to the visitors. Slight mistakes of health workers can lead to a huge conflict. Problems related to service management such as quality health care facilities, hospital waste, staff management will arise if a proper management plan will not be prepared. *The envisaged impact is direct in nature, low in magnitude, local in extent, long time in duration; thus, this impact is significant.*

7.2.1.3.8 Impact due to infectious diseases such as COVID-19 and HIV/AIDS

Current evidence suggests that people with HIV have a higher risk of becoming seriously ill from COVID-19. People living with HIV who are not on treatment or virally suppressed may be even greater risk. As with the general population, older people living with HIV and those with other underlying health conditions should take extra precautions to prevent illness. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration, so this impact is significant.*

7.2.2.3.9 Impact due to occupational health and safety

The health and safety of hospital staff and patients in the hospital will be a prime concern of the top management. If necessary, information will not be given before handling equipment, and chemicals may result in occupational diseases and accidents. X-ray lab may also be exposed to radiation hazards. Although the primary victims will be the staff, patients, and caretakers, sometimes the local people may also be affected. All individuals exposed to hazardous healthcare waste will be at risk, including those within healthcare establishments

that generate hazardous waste and those outside these sources who handle such waste or are exposed to it due to careless management. The main groups at risk are the following:

- medical doctors, nurses, health-care auxiliaries
- patients in hospital
- visitors to hospital
- workers in a hospital such as laundries, waste handling, and transportation workers in waste disposal facilities

Following possible infections will occur due to mishandling of the health care waste.

Table 7-2: Possible infections due to mishandling of waste

Type of infection	Examples of causative organisms	Transmission medium
Gastroenteric infections	Enterobacteria, e.g. *Salmonella, Shigella spp.; Vibrio Cholera; helminths*	Feces and/or vomit
Respiratory infections	Mycobacterium tuberculosis; measles virus; *Streptococcus pneumonia*	Inhaled secretions; saliva
Genital infections	*Neisseria gonorrheae;* herpesvirus	Genital secretions
Skin infections	*Streptococcus spp.*	Pus
Anthrax	*Bacillus anthracis*	Skin secretions
Meningitis	*Neisseria meningitides*	Cerebrospinal fluid
Acquired immune deficiency Syndrome	Human immunodeficiency virus (HIV) (AIDS)	Blood, sexual secretions
Viral hepatitis A	Hepatitis A virus	Feces
Viral hepatitis B and C	Hepatitis B and C viruses	Blood and body fluids

The envisaged impact is direct in nature, high in magnitude, local in extent, long term in duration hence this impact is very significant.

7.2.2.3.10 Impact due to traffic congestion

Traffic density may increases with the rate of increase in commercial markets and flow of number of people in hospital areas. The daily activities of people nearby hospital site will result in increase in traffic density. However, the centre will built parking space with enough capacity and traffic security officers are prepared, thus it is predicted that these impacts will be controlled. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration; hence this impact is significant.*

7.2.2.3.11 Impact due to influx of people in the project area

Increasing influx of hospital relevant person may lead to create traffic congestions and accidents. *The envisaged impact is direct in nature, moderate in magnitude, local in extent, long term in duration, so this impact is significant*

7.2.3 Evaluation of Adverse Impact

Table 7-3: Evaluation of Adverse Impact

Issues	Impacts	Impacts Rating				Total Score	Significance of Impact
		Nature	Magnitude	Extent	Duration		
Construction Phase							
Physical and Chemical Environment							
Impact due to construction waste	Construction waste includes debris, broken brick pieces, left out/non-usable reinforcement bars, sand, stone, waste cement, sand mix and packing materials. If construction waste does not manage properly can cause problems to the local environment.	D	H (60)	SS (10)	ST (05)	75	Significant
Impact due to air pollution	Activities like site clearance use of heavy vehicles and machinery will significantly contribute to air pollution.	D	H (60)	Lo (20)	ST (05)	85	Very Significant
Impact due to soil contamination	The waste will also contain hazardous lead-based paint residues, paints and solvents, cement, diesel fuel, oil, heavy metals, and other products that could be considered hazardous waste, reducing soil quality.	D	M (20)	SS (10)	ST (05)	35	Insignificant
Impact due to noise pollution	The most commonly reported impacts of increased noise levels are interference in oral	D	H(60)	SS(10)	ST(05)	75	Significant

	communication and disturbance in sleep.						
Impact due to water pollution	Waste generated from construction activities will contaminate water source if not managed properly.	ID	M(20)	SS(10)	ST(05)	35	Insignificant
Impact due to land vibration	Vibration is generated from the vibrator equipment during soil compaction.	D	L(10)	SS(10)	ST(05)	25	Insignificant
Impact due to groundwater extraction	If the withdrawal rate exceeds the recharge rate, there will be a chance of groundwater depletion in the surrounding area.	D	M(20)	Lo(20)	ST(05)	45	Significant
Impact due to stockpiling of construction material	Construction materials such as soil, gravel, sand, aggregates, etc., or excess material are usually stockpiled within the construction site. This may lead to blowing away of the dust particles. Heavy rain also can wash away the finer particles and pollute surface water.	ID	L(10)	SS(10)	ST(05)	25	Insignificant
Topography and geology (landslide/corruption of project area and embankment)	Topography will change from its natural stage	D	M(20)	SS(10)	LT(20)	50	Significant
Biological Environment							
Impact on urban biodiversity/ Ecosystem	The proposed site lies in the barren land, and no trees will be felled down due to construction of the project. Due to haphazardly disposal of solid waste generated by workers may affect avifauna	D	L(10)	SS(10)	ST(05)	40	Insignificant

	(crow, sparrow, etc.) of local surroundings.						
Socio-economic and cultural Environment							
Child labor and discrimination towards women labor	During the construction phase, contractors may exploit children and women to work for their benefit.	D	L(10)	Lo(20)	ST(05)	35	Insignificant
Impact due to occupational health and safety	Prolonged exposure to smoke and dust pose health problems such as respiratory problems and eye diseases. Similarly, skin burning, hand and foot cement-bitten and bitumen works are also possible among workers.	D	H(60)	SS(10)	ST(05)	75	Significant
Impact due to conflict between workers and local people	May cause conflicts between outside workers and local people. Conflicts may arise due to the outside workers" insensitivities towards the local customs, norms and religion, harassments, alcoholism, prostitution, the spread of STDs, sharing of resources like drinking water, etc.	D	L(10)	SS(10)	ST(05)	25	Insignificant
Impact due to traffic congestion	As the number of vehicles will be increased this may contribute to traffic congestion due to lack of proper parking area.	D	H(60)	SS(10)	ST(05)	75	Significant
Impact due to influx of people in the project site	The influx of workers in the project site can lead to adverse social and environmental impacts on local communities.	D	M(20)	Lo(20)	ST(05)	45	Significant
Operation Phase							
Physical and Chemical Environment							

Impact due to Hospital waste generation	Medical activities will be live saving, however, while doing patient care, health care waste might be generated that could be hazardous, toxic and even lethal if not handled properly. The hazardous and toxic parts of waste from hospital complex comprise infectious, biomedical, human tissues and radioactive material and sharps (needles, knives, scalpels, etc.). They constitute a serious risk to public health and the environment if not managed properly.	D	H(60)	Lo(20)	LT(20)	100	Very Significant
Impact due to waste water generation	Wastewater generated from laboratories, Operation Theater, X-ray department, hospital ward, toilet, and disinfection and cleaning during the hospital's operation will be hazardous if not treated properly.	D	H(60)	SS(10)	LT(20)	90	Very Significant
Impact due to air pollution	Operation of the generator and vehicular emissions will contribute to air pollution, which can cause health problems.	D	M(20)	Lo(20)	LT(20)	60	Significant
Impact due to soil pollution	Infectious and chemical wastes are not properly managed, which will can cause severe problems in cultivated land	D	H(60)	Lo(20)	LT(20)	100	Very Significant
Impact due to noise pollution	The main source of noise pollution during hospital operation will be from movement of vehicles and the operation of	D	M(20)	Lo(20)	LT(20)	60	Significant

	the generators, which cause health problems.						
Impact due to water pollution	Wastewater from the radiological laboratory, pathological laboratory, and laundry is also a significant polluter, giving rise to contamination with heavy metals in surface water.	D	M(20)	L(20)	LT(20)	60	Significant
Energy fulfillment for the hospital operation issues	The hospital sometimes takes a high load of current and electricity so that it causes load shedding problems several times a week in the project affected area	ID	L(10)	SS(10)	LT(20)	40	Insignificant
Lowering water table due to extraction of groundwater and effect on adjoining source	Withdrawal rate exceeds the recharge rate; there will be a chance of groundwater depletion in the surrounding area	D	M(20)	SS(10)	LT(20)	50	Significant
Disaster risk reduction (earthquake, fire hazards, lighting, etc.) in hospital	Loss of lives and properties due to different probable disasters like fire, earthquake, etc.	ID	M(20)	L(20)	LT(20)	60	Significant
Radiation hazard from radiological equipment	Radiation hazards from radiological equipment can cause health problems	D	H(60)	SS(10)	LT(20)	90	Very significant
Biological Environment							
Impact on urban biodiversity	The haphazard disposal of solid waste generated from the hospital may affect avifauna (crow, sparrow, etc.) of the local surrounding.	D	L(10)	Lo(20)	LT(20)	50	Significant
Socio-economic and cultural Environment							
Health and sanitation in and around the hospital	If hospital wastes are not properly segregated and disposed of, it may	D	M(20)	Lo(20)	LT(20)	60	Significant

	create a risk to hospital visitors as well as nearby settlement						
Food safety issues for patients, visitors, and staff	Unhygienic food and sanitation might cause different health problems.	D	M(20)	SS(10)	LT(20)	50	Significant
Hospital management issues	Slight mistakes of health staff can lead to a huge conflict. Problems related to service management such as quality health care facilities, hospital waste, staff management will arise if a proper management plan will not be prepared.	D	M(20)	Lo(20)	LT(20)	60	Significant
Grievances management	Complaints related to impacts, demands, services, financial support for community development are the primary concern of grievance management	D	M(20)	Lo(20)	LT(20)	60	Significant
Law and order situation	Different discussions and confusions may arise during the operation of the hospital. Complaints related to impacts, demands, services, financial support for community development are the primary concern of grievance management	D	L(10)	Lo(20)	LT(20)	50	Significant
Impact due to haphazard market growth	Haphazard market growth will cause disturbance in the people mobility	ID	L(10)	Lo(20)	LT(20)	50	Significant
Public services and facilities	Slight mistakes of health workers can lead to a huge conflict. Problems related to service management such as quality	D	L(10)	Lo(20)	LT(20)	50	Significant

	health care facilities, hospital waste, staff management will arise if a proper management plan will not be prepared.						
Impact due to infectious diseases such as COVID-19 and HIV/AIDS	Current evidence suggests that people with HIV have a higher risk of becoming seriously ill from COVID-19.	D	M(20)	Lo(20)	LT(20	60	Significant
Impact due to occupational health and safety	All individuals exposed to hazardous healthcare waste will be at risk, including those within healthcare establishments that generate hazardous waste and those outside these sources who handle such waste or are exposed to it due to careless management.	D	H(60)	Lo(20)	LT(20)	100	Very Significant
Impact due to traffic congestion	Traffic density increases significantly with the rate of increase in the commercial markets and the flow of a number of people in the hospital area.	D	M(20)	Lo(20)	LT(20)	60	Significant
Impact due to influx of people in the project area	Due to increase in patient flow in hospital will have additional pressure on the existing public utilities such as electricity, water supply, waste disposal, and municipal drainage system facilities, transportation available at the location of the hospital	D	M(20)	Lo(20)	LT(20)	60	Significant

CHAPTER 8 : Environmental Enhancement and Mitigation Measures

In this chapter the site-specific enhancement measures and mitigation measures for both beneficial and adverse impact due to construction and operation of proposed project has been discussed.

8.1 Enhancement Measures

The following environmental enhancement measures will be implemented during the construction and operation phase of the hospital. The environmental enhancement and mitigation measures are given in Tables 8-1.

Table 8-1: Augmenting Measures, Responsible Agency and Cost for Beneficial Impact

Beneficial Impact	Augmenting Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
Employment opportunity	• Local people will be given priority for employment	Project Area	Construction/ Operation phase	No additional cost	Proponent
Increase in economic activities	• Create an appropriate environment to establish medical shops (clinic, pharmacy, etc.)	Around the Project area	Construction/ Operation phase	No additional cost	Proponent
Technical skill enhancement	• Training Program for Skill Development	Project Area	Construction/ Operation phase	300,000	Proponent
Healthcare opportunities for local people and whole nation people	• Free health camps will be conducted • Quality health services will be given to the local people and other people • Discount facility for project affected people	Around Project area and project-affected municipality	Operation phase	400,000	Proponent
Increment of Land value	• Land near the project can be used to establish offices, shops, and restaurants, which will serve the increased number of people who do business in the Dhulikhel Hospital Trauma and Emergency Center	Around Project area and project-affected municipality	Construction/ Operation phase	No additional cost	Proponent/ local Government
Discount facility to local people and free health service to poor, helpless people and disabled patient	• Discount facilities to local people • Free health services for poor and disabled patient • Allocation of 10 percent of bed for poor and disabled patient • Health Camp will be conducted in the different time interval	Trauma Centre	Operation phase	300,000	Proponent and Local government

Emergency health Care Service for Trauma Patient	• Work toward resuscitation, treatment, and rehabilitation care of all such patients.	Around Project area and project-affected municipality	Operation phase	No additional cost	Proponent and Local government
Total Enhancement Cost (Construction + Operation)				**10,00,000**	

8.2 Mitigation Measures

Environmental Mitigation measures have been proposed for the adverse impact due to implementation of the proposed project. The mitigation measures will be compensatory, preventive and curative. Mitigation measures are given in Table 8-2, 8-3, and 8-4.

Table 8-2: Summary of Physical and Chemical Environment Impact Mitigation Measures, Responsible Agency and Cost

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
Construction Phase					
Impact due to construction waste	• Construction waste generated during the construction phase will be separated and reused as far as possible • Waste soil from the construction area will be reused or disposed of to a designated landfill site • Waste oil of the construction machines will be collected and disposed of at the licensed agent. • Waste chemical and hazardous material will be stored at the contractor's office and disposed of by a licensed agent • Domestic solid wastes will be collected and disposed of by the Municipality. • Spoil generated during excavation for construction of hospital building will be safely stockpiled in proper places and such materials will be used for ground leveling. • Packing materials leftover reinforcement bars will be sold to the vendor.	Project Construction Site	Construction phase	250,000	• Proponent • Contractor
Impact due to air pollution	• All the loose material stacked or transported, will be provided with suitable covering such as plastic, tarpaulin, etc.	Project Construction Site	Construction Phase	250,000	• Proponent • Contractor

	• Water sprinkling will be done at the location where dust generation is anticipated. • Mask will be provided to the workers engaged in dust generation activity. • Loading and unloading of dusty materials will be handled carefully. • Open defecation from workforce will be strictly restricted, and sufficient temporary toilets for workforce will be constructed • Heavy vehicles and generators will be maintained regularly. • If required, water sprinkling will be carried out on the construction area and connected road. • Periodical cleaning will be done for connected public roads				
Impact due to soil contamination	• Excavated soil will be analyzed and confirm the quality is under standard values. • Polluted soil will be treated and used as construction material if excavated soil is polluted. • Construction machines will be maintained not to leak oil on the construction site. • Waste oil of the construction machines will be collected and disposed of with the help of licensed agent. • Waste chemical and hazardous material will be stored at contractor's site and disposed at license agent	Project Construction Site	Construction Phase	150,000	• Proponent • Contractor

	• Construction materials will be kept at stockpiling site. • Materials like grease, oils, and spoils will be properly handled.				
Impact due to noise pollution and vibration	• Construction activities and operation of construction machines will be limited in the daytime and weekday basically • Construction machines will be well maintained and checked everyday • Information disclosure includes construction schedule and activities in advance to the surrounding community. • The noise level will be monitored weekly during the project construction stage to ensure that the noise level will not exceed government standards. • Pressure horns will be strictly prohibited in and around the project area • Less noise emitting diesel generators will be used. • Ear mufflers will be provided to the construction workers.	Project Construction Site	Construction Phase	150,000	• Proponent • Contractor
Impact due to water pollution	• Turbid water from unpaved construction area will be treated in sedimentation pond. • Waste oil of construction machines will be stored and disposed of to designated site • Construction machines will be maintained not to leak oil in the base-camp site. • Provision of sanitation facilities, if required	Project Construction Site	Construction Phase	250,000	• Proponent • Contractor

	• Domestic wastewater and night soil from the construction area will be treated and discharged to the designated site and facilities. • The construction site will not be allocated at waterlogging area or roadside. • Seepage of hazardous liquid will be immediately controlled to prevent groundwater pollution. • The mixing of construction materials and paint, grease, etc. will be handled appropriately.				
Impact due to groundwater extraction	• Recharge pits will be constructed to recharge the groundwater. • Rainwater harvesting technology will be adopted. • Groundwater extraction permit. will be taken from the concerned agency • Open space will be allocated to increase the infiltration capacity of the soil. • Greenery will be maintained around the hospital site	Project Construction Site	Construction phase	300,000	• Proponent • Contractor
Impact due to stockpiling of construction material	• Only allocated sites will be used for the quarrying of construction materials. • Avoid the formation of ditches and pounding at the site. • Only the estimated quantity will be excavated from the allocated area.	Project Construction Site	Construction Phase	No additional cost	• Proponent • Contractor
Topography and geology (landslide/corruption of project area and embankment)	• Installation of slope and stabilizing embankment with appropriate measures. • Plantation of trees in the landslide-prone area	Project Construction Site	Construction Phase	250,000	• Proponent • Contractor

Operation Phase					
Impact due to healthcare waste generation	• The hospital will follow 6R principle (i.e. Rethink, Refuse, Reduce, Reuse, Recycle, and Repair). • Separate container/bin will be used for different types of hospital waste and color-coding will be used as per international and national practice such as red for infectious waste, green for general waste • Infectious waste will be disposed of after autoclaving • For the disinfection of sharp, suitable chemical disinfection will be used, which will be destroyed using a needle destroyer. • General waste will be segregated into organic and non-organic waste • Organic waste and inorganic waste will be sent to municipal waste in separate transfer bags • Mercury-free equipment will be in hospital • The hospital will only purchase and use mercury-free equipment and replace mercury BP sets with digital BP sets etc. • Awareness among the workers for the safe handling of chemicals will be raised. • Supervision will be done to avoid the spills of any chemicals. • Chemical wastes will be discarded after making it disinfectant.	Hospital Compound	Operation phase	600,000	• Environment management unit • Health Care Waste Management Committee under the Chairmanship of Hospital Director • Hospital wards • Proponent

Impact due to waste water generation	• Wastewater generated from different activities will first be collected into the collection tank • Wastewater from the lab, Operation Theater will be collected in a pre-treatment concrete pit/poly tank, where it will be treated with disinfectants based on chlorine solutions and then discharged to a reed bed system for treatment • A suitable drainage system will be designed for the proper disposal of septic tank sewage waste	Hospital Compound	Operation phase	500,000	• Environment management unit • Proponent
Impact due to air pollution	• Vegetation barrier will be used to prevent air pollution level • Silent DG set will be used • Periodic maintenance of generator will be done • Hospital is declared as "No smoking zone" and smoking in premises will be strictly prohibited. • Open burning of waste will be strictly prohibited.	Hospital area	Operation phase	300,000	• Environment management unit • Proponent
Impact due to soil pollution	• Materials like grease, oils will be properly handled. • Provisions for adequate infrastructure facilities such as suitable drainage systems, wastewater collection, and conveyance, including treatment and reuse, will be developed	Hospital area	Operation phase	300,000	• Environment management unit • Proponent
Impact due to noise pollution	• Silent DG set will be used • Earplugs would be provided to workers working in the laundry room if the machinery system is adopted.	Hospital area	Operation phase	200,000	• Environment management unit • Proponent

	• Installment of hood/exhaust insulation in the surgical room • The curtain will be kept in all wards. • Traffic signs indicating horns prohibition area and speed limits (up to 15 km/hr) will be placed				
Impact due to water pollution	• The drainage system will be maintained properly. • Monitor timely to avoid leakage of drainage system	Hospital area	Operation phase	300,000	• Environment management unit • Proponent
Energy fulfillment for the hospital operation	• Installation of silent DG sets • Connected to National Grid Line • Installation of solar panel • Use LED lamps instead of Filament lamps and CFL for the lightening purpose	Hospital area	Operation phase	Included in project cost	• Environment management unit • Proponent
Lowering water table due to extraction of groundwater and effect on adjoining source	• Alternative measures for water provision shall be prepared if the water level and water quality at the nearest well change during construction. • A recharge pit will be installed to maintain the soil infiltration capacity • Open space will be allocated in the hospital premises • Rainwater harvesting will be adopted to reduce the maximum extraction of groundwater.	Hospital area	Operation phase	Included in project cost	• Environment management unit • Proponent
Disaster risk reduction (earthquake, fire hazards, lighting, etc.) in hospital	• National Building Code will be followed and seek approval from the relevant agency • Provision of emergency exit system • Fire extinguisher fire reel hose will be installed at different places • PAS will be provisioned	Hospital area	Operation phase	Included in project cost	• Environment management unit • Proponent

	• Staff will be trained for emergency preparedness • Staff will be trained for proper operation and regular maintenance of equipment • Prohibition of unauthorized entry • Disaster risk management training will be provided to staff.				
Total mitigation Cost for Physical and Chemical Environment				**38,00,000/-**	

The summary of biological impacts during construction and operation phase along with their mitigation measures is presented in table 8-3.

Table 8-3: Summary of Biological Environmental Impact Mitigation Measures, Responsible Agency and Cost

Adverse Impact	Mitigation Measures	Where to implement	Duration	Costs (NPR)	Responsible agency
Construction Phase					
Impact on urban biodiversity/ ecosystem	• Appropriate management of hazardous material such as oil and waste. • The domestic garbage will be stored and disposed safely.	• Project Construction Site	• Construction Phase	200,000	• Contractor • proponent
Operation Phase					
Impact on urban biodiversity	• An open space will be separated to develop greenery with landscape Architecture. The garden also releases fresh and clean air that makes the visitor tension free • Plantation of saplings in the hospital premises to maintain environment friendly environment.	• Hospital compound	• Operation Phase	300,000	• Proponent • Environment Management Unit
Total Mitigation Cost				**500,000**	

The summary of socio-economic and cultural impacts and their mitigation measures is presented in table 8-4.

Table 8-4: Summary of Socio-economic and Cultural Environmental Impact Mitigation Measures, Responsible Agency and Cost

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
Construction Phase					
Child labor and discrimination toward women labor	• Dhulikhel Hospital Trauma and Emergency Center will instruct the contractors not to employ child labor and exploitation of female labor in risk-prone areas • Dhulikhel Hospital Trauma and Emergency Center will also strictly comply with the labor related legislations. • No wage discrimination in males and females will be done • Provision of job opportunities and fair salary for any gender. • At least 10% of female workers should be hired as simple workers • No employment under the age of 18 (Article 6.21 " Child Labor" of Conditions Of Contract For Construction For Building And Engineering Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation Of Consulting Engineers (FIDIC) shall be followed	Project Construction Site	Construction Phase	No additional Cost	• Contractor • Proponent
Impact due to occupational health and safety	• Formation of "Waste Management as well as Occupational Health Safety Committees" • Personal Protective Equipment (PPE) such as breathing masks, helmets, earplugs/muffs, gloves, etc., will be provided to the workers in essential areas. • Periodic training and proper instruction on workplace health hazards will be conducted for all workers and supervisors. • Warn the visitors and staff to commit safety rules • Place the various safety signals in each part of the construction yard.	Project Construction Site	Construction Phase	500,000	• Contractor • Proponent

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
	• Regular meetings and training for safety awareness • Practice the SAFETY FIRST motto as a high priority • Relevant laws in Nepal such as "The Labour Act 2017 shall be followed • Additionally, article 23, Occupational Health and Safety, Labor and Working Conditions in IFC Performance Standard 2 shall be applied. • Chapter 6 Staff and Labor including 6.6 "Facilities for Staff" of Conditions Of Contract For Construction For Building And Engineering Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation Of Consulting Engineers (FIDIC) shall be followed				
Impact due to conflict between workers and local people	• Coordinate with local government to place police beat for patrolling the project area. • Make aware the workers about the local practices, cultures, and rules. • Deploy security guards in the project site.	Project Construction Site	Construction Phase	200,000	• Contractor • Proponent
Impact due to traffic congestion	• Safety instruction signboards or hoarding boards will be installed in the risk zone. • Traffic signals will be installed to control the speed. • To avoid road congestion, appropriate traffic management in the access road will be done. • Sign and direction will be dispatched in hoarding boards and information plates regarding the parking management. • Installation of safety signboard such as speed limit and residential area in the project area • Deploying flagman at the gate of construction area and intersections for traffic management	Project Construction Site	Construction Phase	300,000	• Contractor • Proponent

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
	• Installation of safety signboard such as speed limit and residential area in the project area • Installing a fence around the construction site to keep out local people such as children • Installation of the lightning facility in the nighttime in the construction area • Restricting mobilization speed less than 20km/h in the construction site • Implementation of safety training for the workers				
Impact due to influx of people on the project site	• The hospital proponent will coordinate with Dhulikhel Municipality to control the influx of people in the project area. • Local people will be aware the about of population growth • Hospital proponent will help to local government to manage the crowd in the project area.	Project Construction Site	Construction Phase	No additional cost	• Contractor • Proponent • Local Government
Impact due to infectious diseases such as COVID-19 and HIV/AIDS	• Maintain neat and cleanliness in the hospital area by regularly disinfecting the floor and wall of the hospital building. • Installation of sufficient drainage facilities not to provide habitat for vector mosquito. • Provision of adequate temporary sanitation facilities • Enforcement of medical screening and periodic medical check-ups for workers • To prevent the spread of infectious diseases such as COVID-19, awareness of the labors is promoted during construction • Provide adequate Personal Protective Equipment (PPEs) to workers. • Article 6.7 " Health and Safety" of Conditions Of Contract For Construction For Building And Engineering	Project Construction Site	Construction Phase	250,000	• Contractor • Proponent • Local Government

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
	Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation Of Consulting Engineers (FIDIC) shall be followed				
	Operation Phase				
Health and sanitation in and around the hospital	• Conduct Awareness program • Free Health camping will be enhanced • Hospital will spray powder in the drainage • Cleanliness programs will be organized	• Hospital ward • Hospital area	Operation Phase	250,000	• Proponent • Environment Management Unit • Hospital Ward
Food safety issues for patients, visitors, and staff	• Regular monitoring in the hospital canteen will be conducted. • Visitors and the staff of the hospitals are being instructed not to have lunch in the ward. • Canteen should be instructed to provide hygiene food to the patients, staff and visitors	• Hospital ward • Hospital area • Hospital Canteen	Operation Phase	150,000	• Proponent • Environment Management Unit • Hospital Ward
Hospital Management Issues	• The supervisor will be responsible for the supervision of all department and their works • Daily records will be made • Any conflicts will be solved through internal understanding • The Public Announce System (PAS) will be adopted in the hospital to immediately announce emergency and other services. • A Hospital Management Committee will be developed to provide effective health care services • Staff and hospital workers will be punished if they make huge mistakes. • Disable friendly (ramp, lift etc.) will be constructed • Provision of Separate rooms for breast feeding.	• Hospital ward • Hospital area	Operation Phase	No Additional Cost	• Proponent • Environment Management Unit • Hospital Ward

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
Grievances management	• The employee will receive proper instruction to maintain the friendly and harmonious relation between them and the local people. • Any relevant grievances received from the local community will be addressed eventually based on the nature and complexity of the grievances • Grievances redress committee will be formed to address the grievance	• Hospital ward • Hospital area	Operation Phase	No additional cost	• Proponent • Environment Management Unit
Law and order situation	• Strict management plan for the workforce to avoid the unnecessary disputes and conflicts among them. • Proper instruction will be given to the employee to maintain a friendly and harmonious relationship between them and the local people. • If anyone is found guilty, they will be punished or expelled from the job. • The hospital will liaison with local-level administration, including security regularly and as and when needed for maintaining the laws and orders.	• Hospital ward • Hospital area	Operation Phase	No additional cost	• Proponent • Environment Management Unit
Impact due to haphazard market growth	• The hospital Management Committee will coordinate with Dhulikhel Municipality. • Signboards and hoarding boards will be installed to encourage people not to grow the hazardous market.	• Hospital ward • Hospital area	Operation Phase	No additional cost	• Proponent • Environment Management Unit
Public services and facilities	• Focus on the alternative energy sources. • Boring water will be used for the water supply of water. • Solar panels will be installed for alternative energy resources.	• Hospital area	Operation Phase	Included in Project Cost	• Proponent • Environment Management Unit
Impact due to infectious diseases such as COVID-19 and HIV/AIDS	• Maintain neat and cleanliness in the hospital area by regularly disinfecting the floor and wall of the hospital building.	• Around Hospital area	Operation Phase	250,000	• Proponent • Environment Management Unit

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
	• Installation of sufficient drainage facilities not to provide habitat for vector mosquitoes. • Provision of adequate temporary sanitation facilities • Enforcement of medical screening and periodic medical check-ups for workers. • To prevent the spread of infectious diseases such as COVID-19, awareness of the labors is promoted during construction. • Manage the health care waste carefully to avoid its exposure to human • Isolate the communicable disease wards. Provide adequate Personal Protective Equipment (PPEs) to workers, staff and patients. • Aware the public about communicable diseases displaying the pamphlets and posters • Article 6.7 " Health and Safety" of Conditions Of Contract For Construction For Building And Engineering Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation Of Consulting Engineers (FIDIC) shall be followed				
Impact due to occupational health and safety	• Formation of "Waste Management as well as Occupational Health Safety Committees." • Awareness and training to all staff on Health and Safety Issues. • Provision necessary safety gears and follow disease preventive measures • An Emergency Preparedness Plan will be prepared, implemented, and documented.	• Around Hospital area	Operation Phase	350,000	• Proponent • Environment Management Unit
Impact due to traffic congestion	• Roadside parking at the entry of the hospital must be not allowed or relocated by enforcement of law • Awareness camping program will be conducted	• Around Hospital area	Operation Phase	250,000	• Proponent

Adverse Impact	Mitigation Measures	Where to implement	Duration	Cost (NPR)	Responsible agency
	• Speed barrier or breaker for vehicles on the road will be constructed • Traffic sign board such as "no horn signs" and speed limit up to 15 km/hr etc. will be placed • Systematic parking area will be developed in Hospital compound				• Environment Management Unit
Impact due to influx of people in the project area	• The hospital proponent will coordinate with Dhulikhel Municipality to control the influx of people in the hospital area. • Local people will be aware the about of population growth • The hospital proponent will help the local government to manage the crowd in the project area.	• Around Hospital area • Project affected ward	Operation Phase	No additional cost	• Proponent • Environment Management Unit
Total cost for Socio-economic mitigation cost (Construction +Operation)				**25,00,000/-**	

The project is financed by JICA, so following mitigation measures will be done in accordance with JICA Guidelines for Environmental and Social Considerations.

Table 8-5: Comprehensive Mitigation Measures based on JICA Guidelines.

Area	No.	Item	Mitigation Measures	
			During Construction	After Construction
Pollution	1	Air Pollution	• Water sprinkling shall be carried out on construction area and connected road, if required. • Periodical cleaning shall be done for connected public roads	• Not required
	2	Water pollution	• Turbid water from unpaved construction area shall be treated in sedimentation pond and discharged to the river, if required • Waste oil of construction machines shall be stored and disposed to designated site or by the licensed agent. • Construction machines shall be maintained not to leak oil in the base-camp site. • Provision of sanitation facilities, if required • Domestic waste water and night soil from construction area shall be treated and discharged to designated site and facilities.	• Effluent from the Trauma and Emergency Center shall be treated by appropriate sewerage facilities and discharged to Reed bed treatment plant.
	3	Waste	• Waste soil from construction area shall be reused or disposed to designated land fill site • Waste oil of the construction machines is collected and disposed at licensed agent. • Waste chemical and hazardous material are stored at contractor's office and disposed by licensed agent • Domestic solid wastes shall be collected and disposed by the Municipality. • Domestic waste water and night soil shall be treated and/or collected licensed agent.	• Domestic waste from the Trauma and Emergency Center shall be collected and disposed to designated land fill site by the Municipality • Medical waste shall be treated in the Trauma and Emergency Center, and then collected by the licensed agent and disposed at the designated land fill site.
	4	Soil Contamination	• Excavated soil shall be analyzed and confirm the quality is under standard values. Polluted soil shall be treated and used as construction material if	• Implementation of waste water treatment by the sewerage facilities

Area	No.	Item	Mitigation Measures	
			During Construction	After Construction
		and Sediment	excavated soil is not polluted. • Construction machines shall be maintained not to leak oil in the construction site. • Waste oil of the construction machines is collected and disposed at licensed agent • Waste chemical and hazardous material are stored at contractor's site and disposed at licensed agent	• Waste management including medical waste (use same collection and management process of the Dhulikhel Hospital)
	5	Noise and Vibration	• Construction activities and operation of construction machines shall be limited in the daytime and weekday basically • Construction machines shall be well maintained and checked everyday • Information disclosure such as construction schedule and activities in advance to surrounding community.	• Installation of power generator inside of the building not to cause noise pollution
	6	Ecosystem	• Appropriate management of hazardous material such as oil and waste. The domestic garbage shall be stored not to be ate by the animals and birds.	• Medical waste shall be managed as per National Health Care Waste Management Standards and Operating Procedures, 2020. The domestic garbage shall be stored not to be ate by the animals and birds.
	7	Topography and geology	• Installation of slope protection and retaining wall with appropriate measures	• Appropriate maintenance of the installed slope protection
Social Environment	8	Involuntary Resettlement	• Holding consultation meetings for understanding of compensation policy. • Implementation of adequate compensation in accordance with ARAP based on the JICA Guidelines.	• Monitoring based on ARAP
	9	The Poverty		
	10	Water Usage	• Alternative measures for water provision shall be prepared if water level and water quality at the nearest well change during construction.	• Alternative measures for water provision shall be prepared if water level and water quality at the nearest well change

Area	No.	Item	Mitigation Measures	
			During Construction	After Construction
	11	Gender	• Provision of job opportunities and fair salary for any gender. • At least 10% of Female workers should be hired as simple workers	• Not required
	12	Right of Children	• No employment under the age of 18 (Article 6.21 " Child Labor" of Conditions Of Contract For Construction For Building And Engineering Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation Of Consulting Engineers (FIDIC) shall be followed.	• Not required
	13	Infectious diseases such as HIV/AIDS	• Installation of sufficient drainage facilities not to provide habitat for vector mosquito. • Provision of adequate temporary sanitation facilities. • Enforcement of medical screening and periodical medical check-up for workers. • In order to prevent spread of infectious diseases such as COVID-19, awareness of the labors is promoted during construction • Article 6.7 "Health and Safety" of Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation of Consulting Engineers (FIDIC) shall be followed.	• Not required
	14	Labor Environment and Safety	• Relevant laws in Nepal such as "The Labour Act 2017 shall be followed • Additionally article 23 Occupational Health and Safety, Labor and Working Conditions in IFC Performance Standard 2 shall be applied. • Chapter 6 Staff and Labor including 6.6 "Facilities for Staff" of Conditions Of Contract For Construction For Building And Engineering Works Designed by the Employer Multilateral Development Bank Harmonized Edition (June 2010) General Conditions/ International Federation Of Consulting Engineers (FIDIC) shall be followed	• Not required

Area	No.	Item	Mitigation Measures	
			During Construction	After Construction
Others	15	Accident	• Deploying flagman at the gate of construction area and intersections for traffic management • Installation of safety sign board such as speed limit and residential area in the project area • Installing fence around the construction site to keep out local people such as children • Installation of lightning facility in the night time in the construction area • Restricting mobilization speed less than 20km/h in the construction site • Implementation of safety training for the workers	• Appropriate traffic management control for users of the Trauma and Emergency Center

8.3 Mitigation and Enhancement Cost

Table 8-6 summarizes the environmental mitigation and enhancement cost. The total estimated cost proposed for environmental enhancement and mitigation is NPR 78, 00,000/.

Table 8-6: Environmental Enhancement and Mitigation Cost

S.N.	Particulars	Cost (NPR)
Environment Enhancement Measures (Construction + Operation phase) (A)		**10,00,000/-**
Environmental Mitigation Measures		
1.	Mitigation cost for physical and chemical environment (Construction +Operation phase)	38,00,000/-
2.	Mitigation cost for Biological Environment (Construction + Operation phase)	500,000/-
3	Mitigation cost for socio-economic and cultural environment (Construction + Operation phase)	25,00,000/-
Sub-Total: Environmental Mitigation Cost (Construction +Operation) (B)		**68,00,000/-**
Grand Total: Environmental enhancement and mitigation cost (A+B)		**78,00,000/-**

8.4 Environmental Management Plan

An Environmental Management Plan is prepared to enhance beneficial impacts and mitigate adverse impacts during the construction and operation phase of the hospital. The environmental management plan of proposed project is shown in Table 8-7.

Table 8-7: Environmental Management Plan during Construction Phase

Thematic Areas	Adverse impact mitigation activities	What to do	Where to do	How to do	When to do	Who will do	Estimated human resources, budget, time	Monitoring and Evaluation
Physical Environment	**Construction waste management plan**							
	Construction reusable waste will be reused, and recyclable waste will be sold Muck and Spoil waste will be stored safely and used for the filling of land and foundations.	Categorization of construction waste	Hospital construction site	By segregation of waste at the construction site By applying 6R principle (i.e. Rethink, Refuse, Reduce, Reuse, Recycle, and Repair) By filling of land and foundations.	Construction phase	Contractor/ Proponent	Included in chapter 8	Civil Supervising Engineer/Environmental Management Unit
	Solid waste management plan							
	The generated waste will be separated into biodegradable and non-biodegradable waste. Reusable waste will be reused, and recyclable waste will be sold to the vendor Waste will be managed according to the 6R principle.	Categorization of solid waste	Hospital construction site	By adopting the 6R principle (Rethink, Refuse, Reduce, Reuse, Recycle, and Repair)	Construction phase	Contractor/ Proponent	Included in chapter 8	Civil Supervising Engineer/Environmental Management Unit

	Air pollution management plan							
	Sprinkling of water in the construction yard and approach road Regular maintenance of construction machinery and equipment Cover the vehicle when transporting the construction materials Enclose the site by netting structure	Measurement of air	Hospital construction site	Measurement	Construction phase	Contractor/ Proponent	Included in chapter 8	Civil Supervising Engineer/Environmental Management Unit
Socio-economic and cultural Environment	**Occupational Health and Safety Management Plan:**							
	Personal safety equipment such as masks, helmets, earmuffs, gloves etc. will be provided to the workers. All workers will be given risk related training Arrangements will be made for first aid kits such as medicines/bandages etc. required for minor injuries An accident reduction plan will be implemented	To provide occupational safety equipment	Hospital construction site	By providing training and personal safety equipment such as masks, helmets, earmuffs, gloves etc.	Construction phase	Contractor/ proponent	Included in chapter 8	Civil Supervising Engineer/Environmental Management Unit

	Accident insurance schemes will be implemented for the workers							

Table 8-8: Environmental Management Plan during Operation Phase

Thematic Areas	Adverse impact mitigation activities	What to do	Where to do	How to do	When to do	Who will do	Estimated human resources, budget, time	Monitoring and Evaluation
Physical Environment	**Health care waste management plan:**							
	Reduce healthcare waste at the source	To replace the product / change the product / modify the behavior. Prioritize the use of reusable and recyclable items	Hospital ward, pharmacy, laboratory, office, OT room	By reducing healthcare waste at the source	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Categorization of waste	Waste will be segregated at point by labeling color-coded waste bin	Hospital ward, pharmacy, laboratory, office, OT room	By using color-coded waste bin	Operation phase	Proponent EMU Hospital Ward	Included in chapter 8	Environmental Management Unit (EMU)
	Waste collection	Waste will be collected at the central waste collection center.	Central waste collection center	By the collection of waste from different departments	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Healthcare Waste management	Infectious waste will be sterilized by autoclaving Human organs will be kept in the pit. Needles will be destroyed by needle cutter The strategy will be adopted to return the	Central waste collection center	By using different methods for the management of waste	Operation phase	Proponent EMU Hospital Ward	Included in chapter 8	Environmental Management Unit (EMU)

		date expired medicine to the manufacturing company Radioactive waste will be stored safely. A lead coat apron will be used to avoid radiation pollution. Recycle waste will be sold to the vendor						
	Waste disposal	Biodegradable waste will be managed by coordination with Dhulikhel Municipality	Dhulikhel Municipality	Coordination with Dhulikhel Municipality	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Wastewater management plan:							
	The hospital will install a wastewater treatment plant for the treatment of wastewater Waste water will be discharged to drainage after treatment only	Sludge will be collected in the septic tank. Liquid wastewater will be collected in a reed bed treatment plant. The filtered wastewater will be sent to drainage. The treated wastewater will be discharged to municipal drainage as well as used for gardening purposes.	Wastewater treatment area	By the installation of a wastewater treatment plant	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Disaster management plan:							
	To provide training on emergency preparedness	Implementation of emergency accident reduction measures	Hospital area	By providing training	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Construction of Emergency exit	Use of Emergency exit and Ramp	Hospital building	By construction of emergency exit	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)

Installation of a fire control device	Fire extinguishers and fire alarms will be installed on each floor of the hospital building.	Every block/floor of the hospital building	By the installation of the fire control devices	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
Installation of fire extinguisher/smoke detector technology	Installation of fire extinguisher/smoke detector	Every block/floor of the hospital building	By the installation of fire extinguisher/smoke detector technology	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
Storage of water for fire control in case of emergency	Storage of water for fire control in case of emergency Smoke detector	Hospital area	By storage of water in the storage tank	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
To rescue the injured in case of emergency	Formation of emergency rescue committee which include medical officer / surgeon / chief nurse / financial management officer / material storage and supply / security guard	Hospital area	Keeping Records	During hazard	Proponent EMU	1 Medical Officer 1 Surgeon 1 Chief Nurse 1 Security Guard	Environmental Management Unit (EMU)
Traffic management plan:							
A sufficient parking area will be allocated	To park the vehicles in the parking area and to manage the human resources for the related management	Parking area	By allocation of the parking area	Operation phase	Proponent EMU	3 security guard	Environmental Management Unit (EMU)
A separate entry and exit gate will be constructed for	Two main gates will be used	Parking area	By keeping separate entry and exit gate	Operation phase	Proponent EMU		

	vehicular movement							
	To make separate lines for different types of vehicles such as ambulances, vehicles, motorcycles, etc.	Separate line parking for vehicles such as ambulances, vehicles, motorcycles etc.	Parking area	By keeping separate lines for different types of vehicles	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
Socio-economic and cultural environment	**Health, Sanitation, and Security Plan:**							
	A clean environment will be maintained by daily cleaning in the hospital area	To provide training related to sanitation and safety	Hospital area	By providing training	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
		Daily cleaning will be done	Hospital area, ward, toilet, laboratory etc.	By cleaning of the hospital ward, toilet, etc. daily	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
		Security guards will be arranged	Hospital area	By keeping security guards	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
		Proper management of waste	Waste management area	Proper management of waste	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Grievance Redress Management:							
	To reduce the conflict created by addressing the received complaints	Grievance Redress Cell will be established A Complaint Box will be kept in a place where everyone can see.	Hospital	Establishment of Grievance Redress Cell	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)

		To address the grievances that can be resolved immediately by studying the grievances received. Complaints of complex situations will be addressed within 15 days. Complaints and disputes with locals will be resolved through coordination between the two parties.						
	Groundwater Management Plan:							
	Recharge pit will be constructed	Construction of recharge pit	Hospital premise	Construction of recharge pit	Operation phase	Proponent EMU	Included in chapter 8	Environmental Management Unit (EMU)
	Rainwater harvesting technology will be used	Collection of rainwater	Hospital premise	Installation of rainwater harvesting technology	Operation phase	Proponent EMU		

8.5 Health and Safety Plan

The health and safety management committee will be formulated to safeguard the employees through provisions of safety education and training of management, supervision and operatives. The provision of a safe and healthy working environment all times for all employees and visitors during operation of Dhulikhel Hospital Trauma and Emergency Center. A safe system of work will be designed by a health and safety management committee to protect personnel and hospital asset from unforeseen injury, loss and damages. The committee will provide the site safety rules, safety training information and communication, supervision, health and safety training. Similarly, the proponent will compel the workforce to use the personal protective equipment to keep safe occupational health. Prior the construction and operation phases the roles and responsibilities of the health and safety management committee will be prepared. Beside this, the proponent will also prepare plan for prevention of COVID-19.

Table 8-9: Mitigation measures during construction and operation to prevent risks of COVID-19

COVID-19 Prevention and Control Methods	
Special Prevention	• Provision of soap and hand wash to wash hands • Provide sanitizer and personal towel • Personal Protection Equipment (PPE) like surgical sterilize masks, gloves, face shield, gown and apron etc. will be provided to all workers and staffs of the hospital
Personal Protection Equipment's	• Personal Protection Equipment (PPE) like surgical sterilize masks, gloves, face shield, gown and apron etc. will be provided to all workers and staffs of the hospital • Safely remove and dispose PPE so that infection could not spread.
Isolation	• Infected people will be kept in separate room • People contact with infected people will be isolate

8.6 Disaster Risk Management Plan

The disaster management plan include following steps:

i) Preparation of disaster risk management manual/safety manual

The hospital will prepare disaster risk management manual or safety manual outlining the accountabilities and responsibilities of department heads, staff and employee.

ii) Formation of disaster management committee

Formation of a disaster management committee is the first step for making a disaster management plan in hospital. The different departments and officer that comes under the committee are as follows:

- Director-Chairman
- Head of all hospital department/units
- Public Relation Officer – Member
- Officer Medical Store – Member
- Officer General Store – Member
- Nursing Superintendent – Member
- Blood Bank Officer – Member

- Executive Engineer (Civil) – Member
- Executive Engineer (Elec.) – Member
- Chief Medical Officer Casualty & Transport – Member Secretary

iii) Control room

The office of the Director will act as the control and will have good communication network like landline, mobiles and if possible in hospital CUG (Close user group mobile connection). The Chief Medical Officer will ensure that the control room will have all contact numbers of the hospitals, staff which is mentioned in the incident command. The control room will also have contacts numbers of district medical authorities, District Administration Office, Police, Fire Services, nearby hospitals, private physicians, Blood Banks, NGOs etc. which will be contacted if external help will be needed.

iv) Allocation of Patients Treatment Site

The disaster management committee will authorized one of their senior doctor as an operation chief to manage the allocated different site. The treatment place will be decided by the disaster management committee. The location of each area will be planned for the efficiency of the service at the time of emergency.

v) Medical Support Services

The committee will decide who will handle the medical support service. The in charge of medical support services will ensure that the necessary investigations will not be delayed. Further, the in charge will be back up by the other different unit of the hospital.

vi) Logistic arrangements:

The committee will appoint logistic chief who will take charge of supporting services of hospital during the time of disaster:

- Communication
- Transport
- Dietary Supply
- Sanitation
- Water & Electricity

vii) Security:

The hospital will have their own security. The security unit will be briefed about the emergency plan and their role during the time of disaster.

viii) Risk management:

First part of disaster risk management plan is to develop the risk profile. The possible disaster in the hospital is shown in Table 8-10.

Table 8-10: List of possible disaster in the hospital

Hazard	Likely impacts	Time
Earthquake	Human lives lost Hospital infrastructure damaged	Anytime
Fire	Human lives lost Damage to the hospital infrastructure	Anytime

	Destroy the equipment's and machineries	
Strong wind	Damage to the hospital infrastructure	April May June
Urban flood/flash flood	Submerge of hospital infrastructures Damage to hospital building	During Monsoon Season

The disaster management committee will work to reduce the risk of mass casualty situation. There are different natural disasters that can damage the hospital building. The hospital will adopt resilient measures to deal with different types of disaster to reduce impact of damage in their properties and lives of people. Two main possible disaster risks to the hospital are earthquake and fire. The disaster management committee prime responsible is to protect the hospital from the consequences if these disaster and prepare plan for other disasters. For this, the hospital will undertake the multisectoral action that includes:

- Earthquake resistant hospital building will be constructed.
- Installation of early warning system, safe evacuation training, shelter plans and protection from extreme events i.e. earthquakes, floods, hailstorm, fire hazards etc.

ix) Mitigation:

The mitigation plan is the most effective strategy to reduce the risks of disaster. Mitigation plans are related with structural and nonstructural. Structural mitigation measures are planning for buildings, which include follow of building codes, installation of fire extinguishers, fire heel rose, fire hydrant, fire smoke detector etc. Similarly, Nonstructural measures include training for the staffs, insurance for risk transfer and allocation of safe space within hospital.

x) Preparedness:

Under the preparedness, the following things need to be figured out.

- Allocation of open space/safe place to gather during time of disaster
- Ensure proper maintenance and function of all firefighting equipment
- Adequacy of first aid kits
- Prepare the structure for the safety of storehouse that includes medical supplies
- Ensure warning system are in placed that is sirens, horns and light signals for proper indications
- Prepare for arrangement of safe drinking water supply
- Training to all the staff to act in the time of earth quake i.e. Do's and Don'ts for Natural disaster

xi) Response at the time of disaster:

Based on the team formed by the disaster management committee, the designation of the team will play their role as mentioned in the pre disaster phase. This will avoid the duplication of efforts by clear demarcating the area specific task force teams. The emergency support function needs to be response during and after disaster.

xii) Recovery:

Under the recovery stage, the damages of the disaster will be recovered. This depends upon the type of damage and people affected. The task force will start the repairing, restoration, and strengthening of affected structures.

8.7 Traffic Management Plan (TMP)

The traffic management plan is one of the most important part of the overall environmental management plan. The main objective of this plan is to address transportation system management issues in a comprehensive manner and to put all requirements for the safe transport operation in hospital. The EMU will oversight the TMP. Prior the implementation of TMP, the stakeholder consultation will be held to obtain their views, ideas and such justifiable ideas will be incorporated in TMP. The stakeholders include local community, district line agencies, police and traffic police. The office will seek the regular advice and support from nearest traffic office. Based on the site conditions and nature of the job to be performed at Trauma and Emergency Center, two human resource will be recruited while implementing Traffic management plan.

8.8 Grievance Redresses Mechanism

Along with construction and operation of hospital the people may have complain on different activities of the project. Procedure of lodging complain will be established to allow local people, patient and other relevant institution to appeal any disagreeable practice and activities arising from the project activities. There is the potentiality for grievance related to hospital quality services, hospitality, CSR activities, community infrastructure and other community related issues. The hospital will formulate the grievance redress committee to resolve complains. The patient and other stakeholder can lodge his/him complain to hospital office or complaint box. The Executive Director through its staff verifies the issues and gives their decision within 7 days of the compliant register in the office. If the issue is settled, the process ends. If the issue is not solved to the satisfaction, the concern will be forwarded to Hospital Management Committee. They verify the issues and call meeting to solve the problem. The Hospital Management Committee will provide its decision to the concerned issues within 15 days of complain received. If the issue is settled, the process ends. If not settled then process continues according to law. The focal person of grievance redress committee is Grievance Redress Officer.

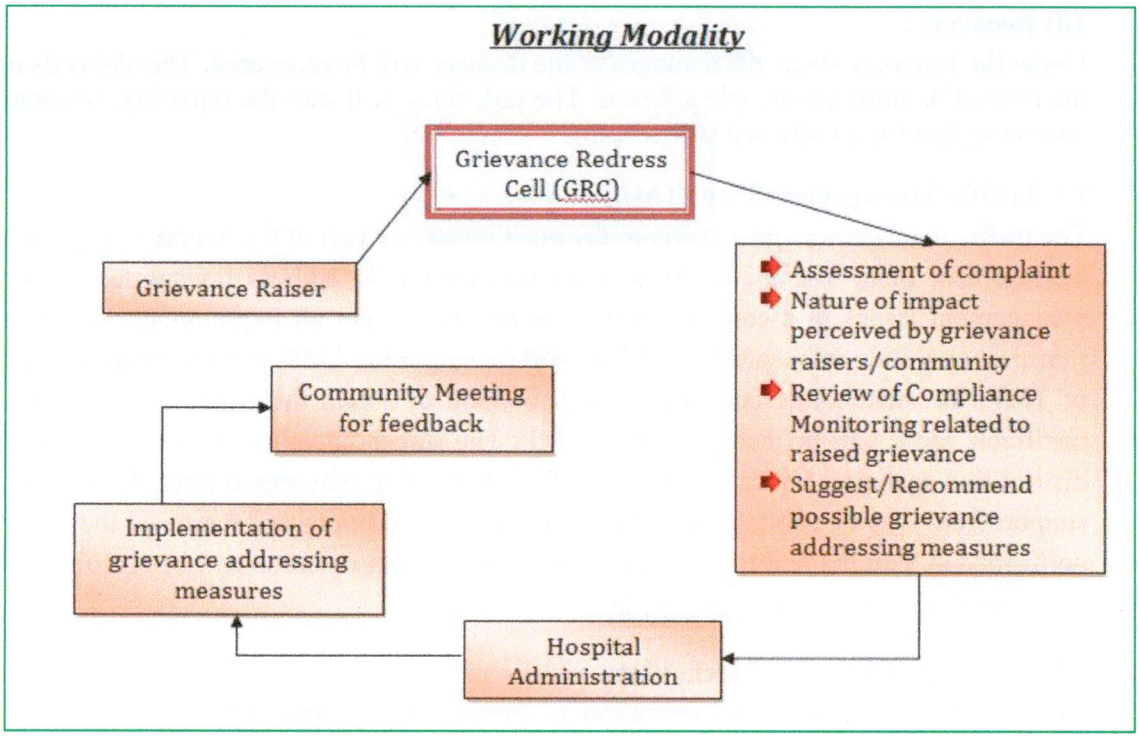


Figure 8-1: Grievance Redress Plan

8.9 Environmental Management Unit and Housekeeping unit

Environmental Management Unit will be established to keep hospital environment friendly. The major duties and responsibilities of Environmental Management Unit will be implementation of environmental management plan, regulatory compliance with all relevant rules and regulations, regular operation and maintenance of pollution control devices, minimization of environmental impacts, implementation of environmental monitoring as per approved schedule, documentation of good environmental practices and applicable environmental laws, coordination with regulatory agencies and external consultants, keeping of log book for public complaints and the action taken, formulation of the waste management plan etc. Beside this, housekeeping unit will be also established in hospital to manage the hospital activities and for keeping proper hospital record.

To ensure the implementation of Environmental Protection Measures, Dhulikhel hospital is committed to establish Environment Management Unit (EMU). EMU is the inbuilt mechanism within the Dhulikhel hospital that governs the implementation and monitoring of the EPMs. The EMU will focus on compliance monitoring, record keeping, and providing technical inputs to the contractors. Apart from having an Environmental Management Plan, it is also necessary to have a permanent organizational set up charged with the task of ensuring its effective implementation of mitigation measures and to conduct environmental monitoring.

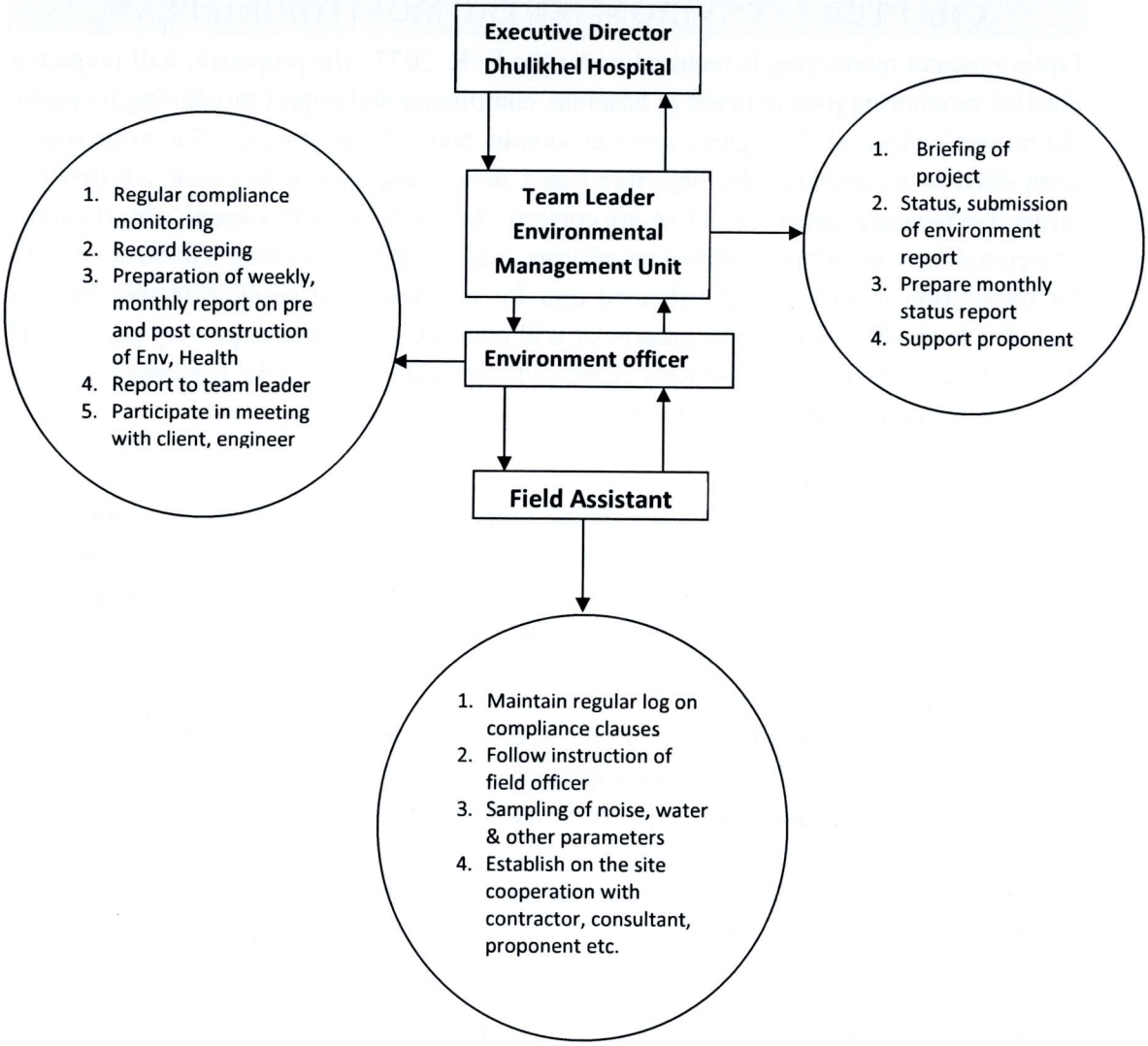


Figure 8-2: Staff and Flow Diagram of Reporting Mechanism

CHAPTER 9 : ENVIRONMENTAL MONITORING PLAN

Environmental monitoring is required under the EPR, 2077. The proponent will prepare a detailed monitoring plan in terms of baseline, compliance and impact monitoring to assess the project's physical, biological, socio-economic, and cultural impacts. The proponent is committed to establishing the objective-based monitoring system to check whether the mitigation measures proposed in EIA are correctly followed or not by experts' observations. The compliance monitoring, impact monitoring, and baseline monitoring will be conducted for monitoring purposes. The estimated cost for environmental monitoring will be also included in the EIA report. The proponent will conduct self-monitoring every six months during the construction and operation phase and submit the report to the concerned agency. The monitoring plan of the project will be given as per the following matrix:

9.1 Baseline Monitoring

Before starting the construction work of the proposed proposal, the basic environmental aspects of the construction site and its surroundings will be surveyed. Because of this, it is possible to know about the changes in the environment in terms of monitoring compared to the initial stage. The baseline monitoring will be conducted as shown in table 9-1.

9.2 Compliance Monitoring

The main purpose of compliance monitoring in the EIA process is to provide the information required to ensure that the project in compliance with the commitments made in EIA study. Compliance monitoring employs a periodic sampling or continuous recording of specific environmental indicators or pollution levels, to ensure project compliance with the recommended environmental standards. The compliance monitoring plan is given in table 9-2.

9.3 Impact Monitoring

To detect the environmental changes caused by the implementation of the proposal, the indicators of the environmental, social, and economic conditions, including the public health of the area, are evaluated during the construction and operation of the project. The impact monitoring plan is given in table 9-3.

Table 9-1: Baseline Monitoring Plan

S.N.	Parameters	Indicators	Methods	Schedule	Location	Responsible agency
1	Noise Level	Loudness and intensity of noise	Sound Level Meter	Before construction	In and around the construction site	Proponent
2	Air quality	TSP, PM 10, PM 2.5, CO, So2, No2	Inspection and measurement of data with high volume sampler	Before construction	In and around the construction sites and along the road corridor	Proponent
3	Water Quality	Different physio-chemical parameters (turbidity, temperature, DO, BOD, hardness, etc.)	Lab Test	Before construction	Construction Site	Proponent
4	Socio-economic Survey	Population, Population density, Socio environment	Review of CBS data, Municipality level profile	Before construction	Construction Site	Proponent

Table 9-2: Compliance Monitoring Plan

Parameter	Indicators	Methods	Duration	Monitoring Frequency	Responsible Agency	Monitoring Agency
Physical Environment						
Implémentation of EIA recommandation regarding design and facilites in the hospital	Incorporation of EIA recommendation to the Project document, design of infrastructure	Review of the detail design, specification, and tender documents of the project	Construction and operation phase	Once after the project design and completion of tender documents	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Compliance with environmental protection measures, including pollution prevention, water, soil protection, waste management	Dust level and noise at the construction site, neighbouring households, and laborers; fuel, smell; PM10, PM 2.5, SPM; Noise level	Observation, review of records, measurement, discussion with workers, monitoring using Noise meter	Construction and operation phase	Quarterly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Ambient air quality	Foul smell, PM_{10}, $PM_{2.5}$, TSP, Carbon Monoxide, Suspended particulate matter	measurement and review of records	Construction and operation phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Solid waste management	Observation during segregation and transportation	Use of separate color-coded dustbins	Construction and operation phase	Weekly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Wastewater management	Water quality parameter of STP effluent	Sampling, lab testing, and comparing with generic standard	Construction and operation phase	Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Water quality parameter	Water quality parameter	Sampling, lab testing, and comparing with NDWQS	Construction and operation phase	Twice in a year (half Yearly)	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality

Noise level	Generator	Direct measurement in dB (A) at different points in different time zones using a Sound level meter	Construction and operation phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Separate management for health care waste and other wastes like radioactive and sharps	Observation and hospital report review	Collection, disinfection, and destroying systems	Operation phase	Daily monitoring and following the instructions as given by concerned authority	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Awareness training, emergency preparedness	Number of training and lists of participants	Observation, interview with staff and public, checking hospital records	Operation phase	Twice in a year(Half Yearly)	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
				Twice in a year (Half Yearly)	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Biological Environment						
Greenery and landscaping design with parking area	Observation of open space /area allocated	Observation	Operation Phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Socio-economic and Cultural environment						
Employees to locals	Number of locals working	Inspection and interviewing with staff	Construction and Operation phase	Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Occupational health and safety measures	Use of safety equipment/tools Regular health check-ups	Review of records and interaction with workers/ staff	Construction and Operation phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Use of child labor and Gender violence	Individuals working Complains related to gender violence	interviewing; inspecting hospital records	Construction and Operation phase	Quarterly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality

Free health services to poor and needy people	Number of people given free health services	Inspecting hospital record	Operation phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Clean up and reinstatement of the construction	Decommissioned sites indicate no adverse/residual environmental impacts and are rehabilitated to the satisfaction of the supervisor and proponent	Site observation; comparing photos; consultation	Construction phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality
Formation of waste management committee	Document record	Review of records and minuting	Operation phase	Half Yearly	EMU/ Proponent	MoFE, DoEnv, MoHP, Dhulikhel Municipality

Table 9-3: Impact Monitoring Plan

Parameter	Indicators	Methods	Monitoring Frequency	Monitoring Agency	Responsible Agency
Physical Environment					
Solid waste management	Types and quantity of wastes and their management practices, complaints from the local bodies	Inspection, Use of separate color-coded dustbins	Monthly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Management of healthcare wastes	Types and quantity of waste and their management practices	Inspection and check records	Monthly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Separate management for health care waste and other wastes like radioactive and sharps	Observation and Hospital report review	Collection, disinfection, and destroying systems	Monthly or as directed by the concerned authority	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Wastewater	Different physio-chemical parameters (turbidity, temperature, DO, BOD, hardness, etc.)	Sampling and laboratory analysis	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Water quality for hospital use	Different physio-chemical parameters (turbidity, temperature, DO, BOD, hardness, etc.)	Sampling and laboratory analysis	Quarterly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Air quality	TSP, PM 10, PM 2.5, CO, So2, No2	Measurement by High volume sampler	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Noise level	Noise level	Sound level measurement	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent

Disaster risk management system	Awareness to the staff, Information system to the public, provision of fire extinguisher and stocking of water for firefighting, Open space for rescuing.	Observation, interview with staff and public, checking hospital records	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Biological Environment					
Development of Green area and landscaping	Developed green area and landscaping	Observation	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Socio-economic and Cultural Environment					
Local employment	Number and types of local employees	Review of records	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Occupational health and safety measures	Accidents and complaints record	Review of records	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Free health services to poor and needy peoples	Number of people given free health services	Inspecting hospital record	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent
Facilitation to local business	Number of suppliers	Review of procurement	Yearly	MoFE, DoEnv, MoHP, Dhulikhel Municipality	EMU/Proponent

This project cost is financed by JICA, so following environmental monitoring during and post construction will be done in accordance with JICA Guidelines for Environmental and Social Considerations and reported periodically.

Table 9-4: Environmental Monitoring Plan Item, Methodology, cost based on JICA Guidelines (During Construction-2 years)

Area	S.N.	Item	Parameter	Method	Location	Frequency a year	Direct Cost (NPR)	Conservation Target*3
Natural Environment	1	Air pollution	TSP, PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, Ozone	Base on the indicated methodology in the National Ambient Air Quality Standards for Nepal, 2012	**3 Location** Hospital Site Construction Site Road Site	**1 time / year x 2 years** (Dry season)	**381,000** (1 time /year x 63,500 / point x 3 point x 2 years)	National Ambient Air Quality Standards for Nepal, 2012 1. Total Suspended Solid (TSP) 24 hours: 230 $\mu g/m^3$ 2. PM_{10} (Ø< 10µm) 24 hours: 120 $\mu g/m^3$ 3. $PM_{2.5}$ (Ø< 2.5µm) 24 hours: 40 $\mu g/m^3$ 4. Sulphur Dioxide (SO_2) 24 hours: 70 $\mu g/m^3$ Annual: 50 $\mu g/m^3$ 5. Nitrogen Dioxide (NO_2) 24 hours: 80 $\mu g/m^3$ Annual: 40 $\mu g/m^3$ 6. Carbon Monoxide(CO) 8 hours : 10,000 $\mu g/m^3$ 24 hours: 50 $\mu g/m^3$ 7. Ozone

Area	S.N.	Item	Parameter	Method	Location	Frequency a year	Direct Cost (NPR)	Conservation Target*3
								8 hours: 157 $\mu g/m^3$
	2	Water Quality	TSP, pH, temperature, TDS, BOD, Total Coliform	Based on the Nepal Gazette, 30 April 2001 and 23 June 2003 And/or the same methodology of baseline surveys	**2 Locations** Upstream of the construction area and downstream of construction area	**2 times / year x 2 years** (1 time / Dry and Rainy season)	**203,200** (2 times /year x 25400 / point x 2 points x 2 years)	Nepal Gazette, 30 April 2001 and 23 June 2003 (Tolerance Limits for Different Industrial Effluents Discharged into Inland Surface Water(Land /Inland Surface Water)] 1. TSP :30-200 / 50 mg/l 2. pH : 5.5-9.0 / same mg/l 3. Temperature : <40 / same °C 4. TDS: no standard mg/l 5. BOD:50 / same mg/l
	3	Waste	The volume of waste soil and domestic garbage	Record volume of generated waste in the project area	**Waste Storage and collection points**	**4 times/year x 2 years**	**203,200** (4 times /year x 25400 /point x 1 point x 2 years)	Generated construction waste and domestic waste shall be reused or disposed of at the designated site.
	4	Soil Contamination and Sedimentation Quality	Cadmium, Hexavalent chromium, Mercury, Lead, Arsenic, Cyanide, Selenium, Fluorine, Boron	same methodology of baseline surveys	**2 Locations** Where baseline monitoring was carried out.	**1 time** **(before excavation)**	**254,000** (1 time x 127,000 / point x 2 points)	There are no law-based criteria nor international guidelines to be followed; thus following referred standard is proposed (Japanese heavy metal 9 items) 1. Cadmium 2. Hexavalent chromium 3. Mercury 4. Lead 5. Arsenic

Area	S.N.	Item	Parameter	Method	Location	Frequency a year	Direct Cost (NPR)	Conservation Target*3
								6. Cyanide 7. Selenium 8. Fluorine 9. Boron
	5	Noise	Construction noise ($dB(A)L_{Aeq}$)	Noise: 24 hrs continuous measurement (at least 10 min in an hour x 24 hours)	**2 Locations** (NV-1 :Dhulikhel Hospital Quadrangle NV-2: Project Site North)	**2 times / year x 2 years** (2 times / Dry Season)	**508,000** (2 times/year x 63,500 /point x 2 points x 2 year)	There are no law-based criteria nor international guidelines to be followed; thus following is established as a conservation target Japanese Standard during Construction [Noise] dB(A) Reference standard in Japan (construction noise) 07:00-19:00: 85 dB(A)
	6	Topography and geology	Stability of embankment / retaining wall	Condition of embankment / retaining wall	Project area	**4 times/ year x 2 years**	**101,600** (4 times /year x 12,700/time x 2 years)	The embankment and retaining wall does not have any crack or displacement
Social Environment	7	Involuntary Resettlement and The Poverty	Payment and implementation of social assistance in accordance with ARAP	Consultation meeting with and/or survey of the project affected persons (PAPs)	Affected area	Refer to ARAP monitoring plan	Refer to ARAP monitoring plan	There are no law-based criteria nor international guidelines to be followed thus the following is established as conservation target JICA Guidelines: Compensation shall be completed before actual construction activities and securing of livelihood standards

Area	S.N.	Item	Parameter	Method	Location	Frequency a year	Direct Cost (NPR)	Conservation Target*3
								Note) If compensation regarding land acquisition before construction is implemented, monitoring shall be done by internal and external monitoring body
	8	Water Usage	Impacts on surrounding well (underground water level)	Underground water level	2 Wells in the Dhulikhel Hospital	12 times / year x 2 years (every-month)	**304,800** (12 times /year x 12,700 / time x 2 years)	Adverse impacts to the existing wells shall be minimized, and or alternative routes shall be secured as mitigation measures, if water level changes
	9	Infectious diseases such as HIV/AIDS	Number of infected patients such as COVID-19	Confirmation of health check list from contractor	Project area (base-camp site)	4 times / year x 2 years (2 times / Rainy and Dry Season)	**203,200** (4 times /year x 25,400/time x 2 years)	There are no law-based criteria nor international guidelines to be followed; thus following is established as a target The project does not cause infection diseases
	10	Labor Environment	Construction worker's condition	Confirmation of safety devices and conditions via interviews	Project area (base-camp site)	4 times / year x 2 years (2 times / Rainy and Dry Season)	**203,200** (4 times /year x 25,400/ time x 2 years)	Following laws and guidelines shall be followed 1. Industrial Enterprises Act, 2020 2. IFC Performance Standard 2 Labor and Working Conditions (FIDIC 2010)

Area	S.N.	Item	Parameter	Method	Location	Frequency a year	Direct Cost (NPR)	Conservation Target*3
Other	11	Accident	Number of accidents	Confirmation of accidents list from local government/ police department	Project area	4 times / year x 2 years (2 times / Rainy and Dry Season)	**203,200** (4 times /year x 25,400 / time x 2 years)	There are no law-based criteria nor international guidelines to be followed; thus following is established as a target Construction activities do not cause any accidents

Total Cost during Construction : (***NPR 25,65,400)*** for 2 years (during construction)

Remarks
*1: Frequency and timing of monitoring can be modified at the detailed design stage
*2: The cost indicates direct cost, not including consultant fee, overhead, and personal expense

Table 9-5: Environmental Monitoring Plan Item, Methodology, cost based on JICA Guidelines (After Construction-3 years)

Area	No.	Item	Parameter	Method	Location	Frequency a year	Direct Cost (NPR)	Conservation Target*3
	1	Air Quality	TSP, PM10, PM2.5, SO2, NO2, CO, Ozone	Base on the indicated methodology in the National Ambient Air Quality Standards for Nepal, 2012	**3 Location** Where baseline monitoring was carried out.	**2 times / year x 3 years** (Dry season and rainy season)	**11,43,000** (2 times /year x 63500 / point x 3 point x 3 years)	**National Ambient Air Quality Standards for Nepal, 2012** 1. Total Suspended Solid (TSP) • 24 hours: 230 $\mu g/m^3$ 2. PM_{10} (Ø< 10µm) • 24 hours: 120 $\mu g/m^3$ 3. $PM_{2.5}$ (Ø< 2.5µm) • 24 hours: 40 $\mu g/m^3$ 4. Sulphur Dioxide (SO_2) • 24 hours: 70 $\mu g/m^3$ • Annual: 50 $\mu g/m^3$ 5. Nitrogen Dioxide (NO_2) • 24 hours: 80 $\mu g/m^3$ • Annual: 40 $\mu g/m^3$ 6. Carbon Monoxide(CO) • 8 hours : 10,000 $\mu g/m^3$ • 24 hours: 50 $\mu g/m^3$ 7. Ozone 8 hours: 157 $\mu g/m^3$
Natural Environment	2	Water Quality	pH,BOD, SS, Total Coliform	Based on the Nepal Gazette, 30 April 2001 and 23 June 2003 And/or the same methodology of baseline surveys	**2 Locations** Upstream of the construction area and downstream of construction area	**2 times / year x 3 years** (1 time / Dry and Rainy season)	**304,800** (2 times /year x 25,400 / point x 2 points x 3 years)	Nepal Gazette, 30 April 2001 and 23 June 2003 (Tolerance Limits for Different Industrial Effluents Discharged into Inland Surface Water(Land /Inland Surface Water)] 1. TSP :30-200 / 50 mg/l

							2. pH : 5.5-9.0 / same mg/l 3. Temperature : <40 / same °C 4. TDS: no standard mg/l 5. BOD :50 / same mg/l
	3	Waste	Volume of domestic waste/night soil from offices	Record volume of generated waste from offices	Waste Storage and collection points	**2 times/year x 3 years**	**152,400** (2 times /year x 25,400/time x 3 years)	Solid Waste Management Rules, 2013 Generated construction waste and domestic shall be reused or disposed of at the designated site.
	4	Soil Contamination and Sediment ation Quality	1.Cadmium, 2.Hexavalent chromium, 3.Mercury, 4.Lead, 5.Arsenic, 6.Cyanide, 7.Selenium, 8.Fluorine, 9.Boron	Same methodology of baseline surveys	**2 Location** Where baseline monitoring was carried out.	**1 time**	**762,000** (1 time/year x 127000 / point x 2 points x 3 years)	There are not law-based criteria nor international guidelines to be followed, thus following referred standard is proposed (Japanese heavy metal 9 items) Cadmium (45mg/kg) Hexavalent chromium (250mg/kg) Mercury (15mg/kg) Lead (150mg/kg) Arsenic (150mg/kg) Cyanide (50mg/kg) Selenium (150mg/kg) Fluorine (4,000mg/kg) Boron (4,000mg/kg)
	5	Noise	Ambient Noise ($dB(A)L_{Aeq}$)	Noise: 24hrs continuous measurement (at least 10min in a hour x 24hours)	**2 Locations** (NV-1 :Dhulikhel Hospital Quadrangle NV-2: Project Site North)	**2 times / year x 3 years** (2 times / Dry Season)	**762,000** (2 times/year x 63500 / point x 3 years x 2 points)	Mix Residential (Ministry of Environment, Science and Technology ,Nepal Gazette 2069-07-13/IFC) Daytime 6:00-18:00

								63 dB(A) /70 dB(A) Night time 18:00-6:00 55 dB(A) / 70 dB(A)
	6	Topography and geology	Stability of embankment / retaining wall	Condition of embankment / retaining wall	Project area	**2 times/ year x 3 years**	**76,200** (2 times /year x 12,700/time x 3 years)	The embankment and retaining wall does not have any cracks
	7	Water Usage	Impacts on surrounding well (underground water level)	Underground water level	2 Wells in the Dhulikhel Hospital	**2 times/year x 3 years (dry and rainy season)**	**76,200** (2 times /year x 12,700 / time x 3 years)	Adverse impacts to the existing wells shall be minimized, and or alternative routes shall be secured as mitigation measures if water level changes

Total Cost after Construction : ***32,76,600 (NPR)*** for 3 years (during operation)

Remarks
*1: Frequency and timing of monitoring can be modified at the detailed design stage
*2: The cost indicates direct cost, not including consultant fee, overhead, and personal expense

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9.5 Institutional Framework for the Environmental Monitoring

a) During Construction

The objectives and design of the EMP and Environmental Monitoring Plan are described in the earlier sections of this chapter. There is a necessity to form a proper 'Institutional Framework' to effectively implement the formulated environmental management and monitoring plan. The elements of this 'Institutional Framework' will coordinate and work with each other throughout the project, i.e., during pre-construction, construction, and operation stages.

The implementation of formulated environmental mitigation measures comes with a cost, so the budgeting of EMP is necessary. The financial source that will provide this budget is discussed in this section.

The suggested elements of 'Institutional Framework' for implementing EMP during construction will be as follows:

a) Project Management Unit (PMU) under Ministry of Health and Population (MoHP)

b) Construction Supervision Consultant (CSC)

(1) Project Management Consultant (PMC)

(2) Environmental Consultant (EC)

c) Project Construction Contractor - Construction Company (PCC)

d) Authorized Environmental Agency (Ministry of Forest Environment (MoFE))

e) Local Government –Dhulikhel Municipality

f) Funding Agency – JICA

The above-stated elements are part of the 'Institutional Framework' that will work together to implement the formulated 'Environmental Management Plan effectively'. The roles and responsibilities of these elements are given in Table 9-6.

Table 9-6: Environmental Monitoring Plan after Construction Phase (2 years)

Name of Organization	Roles and Responsibilities
a) Project Management Unit under MOC (PMU)	• Initiate the coordination process among the concerned organizations (Elements of Institutional Framework) for EMP implementation. • Oversee the implementation of the EMP by PMU and CSC • Review and approve monthly Environmental Report from CSC and send the report to MoHP and MoFE
b) Construction Supervision Consultant (CSC)	• CSC works in association with Project Construction Contractor (PCC) & the Environmental Consultant (EC) on a full-time basis at the project site office. • PMC mainly looks after managing engineering and construction-related activities.
Environmental Consultant (EC)	• EC inspects implementation of mitigation measures and environmental monitoring conducted by PCC • EC reviews and corrects Environmental Monitoring Report (EMR) submitted by PCC and then submits it to PMU after inspection.
c) Project Construction Company (PCC)	• PCC implements approved EMP (mitigation measures) under the observation of PMC & EC. • PCC submits EMR for all conducted mitigation measures on-site to

	the EC on weekly and/or monthly basis.
d) Authorized Environmental Agency (MoFE)	• Inspect and audit periodical environmental monitoring report • Inspect the implementation of mitigation measures on site, as required • Request for necessary action and additional surveys and implementation of mitigation measures, if required
e) Local Government (Dhulikhel Municipality)	• Monitor construction activities • Request for necessary action and additional surveys and implementation of mitigation measures, if required
f) Funding Agency (JICA)	• Review periodical environmental monitoring report • Request for necessary action and additional surveys and implementation of mitigation measures, if required

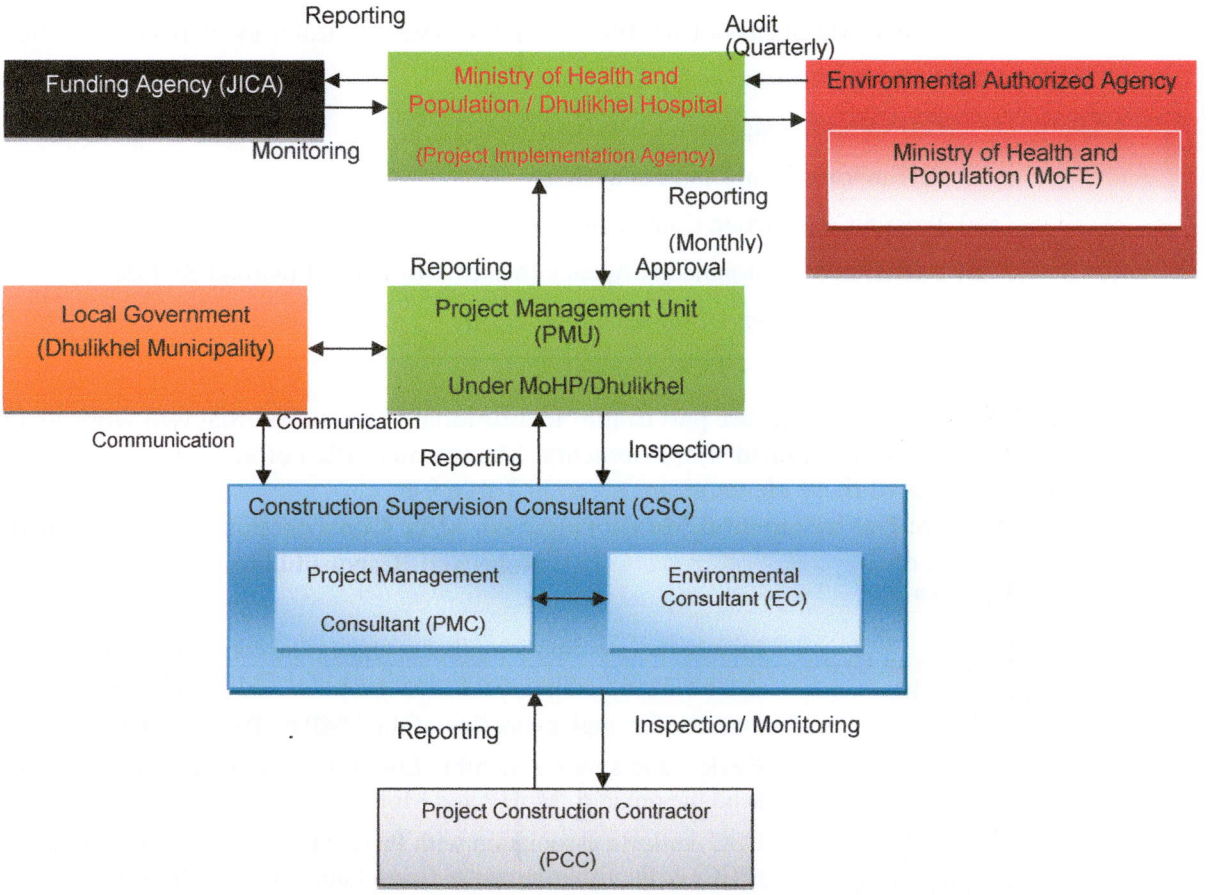

Figure 9-1: Environmental Management Implementation Organizations during Construction

b) After Construction

The major authorities for implementing the EMP after construction are as follows:

a) Responsible Agency: Ministry of Health and Population (MoHP)
b) Local Government: Dhulikhel Municipality
c) Authorized Environmental Agency (MoFE)
d) Funding Agency – JICA

The roles and responsibilities of each organization are shown below:

Table 9-7: Environmental Monitoring Organizations after Construction Phase

Name of Organization	Roles and Responsibilities
a) Ministry of Health and Population (MoHP)/ Dhulikhel Hospital	• Implementation of Environmental Monitoring following approved EMP in the EIA • Preparation of Monitoring Report and Submission to MoFE
b) Local Government (Dhulikhel Municipality)	• Monitor project site (natural condition and social condition) • Request for necessary action and additional surveys and implementation of mitigation measures, if required
c) Authorized Environmental Agency (MoFE)	• Inspect and audit the periodical environmental monitoring report • Inspect the implementation of mitigation measures on-site, as required • Request for necessary action and additional surveys and implementation of mitigation measures, if required
d) Funding Agency (JICA) Regional office	• Review the quarterly environmental report and monthly report • Request for necessary action and additional surveys and implementation of mitigation measures, if required

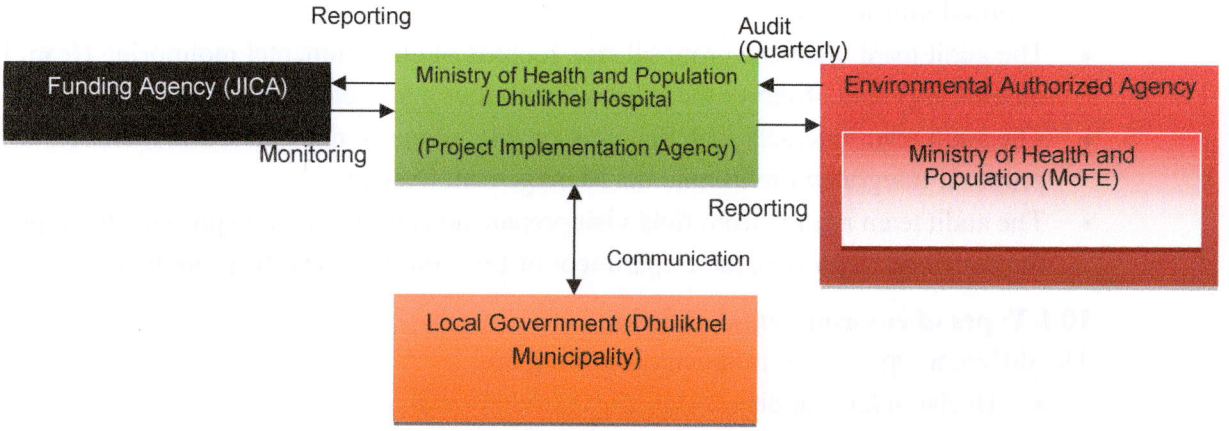

Figure 9-2: Environmental Management Implementation Organizations after Construction

CHAPTER 10 : ENVIRONMENTAL AUDITING PLAN

Environmental auditing is an integral part of EIA as per EPR, 2077. The Ministry or prescribed body will conduct the environmental auditing within 6 months after completion of 2 years of the commencement of the distribution of the service or goods. An environmental auditing plan is prepared.

The primary objective of project performance audit reports includes a final assessment of the degree to which the project satisfied the proposed environmental requirements, the effectiveness of mitigation measures and institutional development, and whether any unanticipated effects occurred due to project activities. Combined with the baseline information, impacts predicted, and mitigation proposed records of both the development and operation phase as per requirement are the main documents for the environmental auditing.

The audit planning of the proposal will involvethe following steps:

- Formation of the audit team
- The audit team collects the secondary information concerning the project, including EIA reports and regular front-line monitoring reports.
- The audit team reviewed the literature and national environmental requirements for the proposal
- The audit team inform the proponent on the audit of the proposal and request the required information
- The audit team visits the proposal site, records of environmental monitoring (front line monitoring) and observes the proposal activities and their impacts directly
- The audit team interacts with the local people, proposal managers, and members of the proposal Integrated Environmental Management System
- The audit team returns from field visit prepare an audit report, and presents the report to the concerned agencies, the Department of Environment, and the proponent.

10.1 Types of environmental auditing

The different types of environmental auditing are:

- Decision level audit
- Implementation audit
- Work effectiveness audit
- Planning impact audit
- Assessed technology audit
- Environmental Impact Assessment Process audit

10.2 Environmental audit usually involves three aspects:

- Examiner
- The tested party
- Third-party

10.3 Environmental auditing may be internal or external, depending on the party or organization involved in the voluntary or binding test:

- Internal auditing
- External auditing
- Mandatory auditing
- Voluntary auditing

Table 10-1: Environmental Auditing framework

Parameter	Indicator	Location	Methods	Sources
Physical Environment				
Land-use change	Construction of the hospital building , blocks, generator site etc.	Hospital building site	Observation	Observation, photographs, and records from the hospital
Solid waste management	Collection bin, foul-smelling around the hospital	In and around the hospital site	Observation	Records, local information, photographs, information from hospital
Wastewater management	Order and color of wastewater	Collection site, drainage	Observation, analysis	Local people, photographs, observations
Air and noise pollution	Emission of dust and air pollution noise pollution	Hospital site and generator site	Observation, interview, and measurement	Local information, photographs, observations
Energy use	Installation of alternative energy solar system, generator	In the rooftop of the hospital and generator site	Observation and inspection	Photographs, interviews, and records
Parking and traffic management	Congestion around the hospital site	Parking site	Observation, interview	Photographs, interviews, and records
Emergency preparedness	Installation of fire hydrants, sprinklers fire extinguishers, and emergency exit	In the hospital and floor	Observation, interview	Photographs, interviews, and records
Use of groundwater	Amount of groundwater withdrawal and rain harvesting system	In the hospital site	Observation and inspection	Photographs, interviews, and records
Earthquake and disaster	Earthquake resistance building	Hospital building	Observation and analysis	Records from structural and architectural drawing
Biological Environment				
Urban biodiversity	Greening and gardening	Allocated area	Observation and interview	Local people, available information, photographs, and observation
Socio-economic and Cultural Environment				

Employment opportunity	Nos. of local labors employed during project construction	In the Hospital	Interview and records	Records, local people, records from the hospital
Skill Development	Nos. of training conducted and employment in post-project	In the Hospital	Interview and records	Records, local people, records from the hospital
Occupational Health and safety	Incident of accident and injuries to the labor and local	In the Hospital	Interview and records	Local people, records from the hospital
Awareness training on emergency preparedness	Number of training and list of participants	In the Hospital	Records and interview	Records from hospital

CHAPTER 11 : CONCLUSIONS AND COMMITMENTS

11.1 Conclusions

The Dhulikhel Hospital Trauma and Emergency Center will have beneficial impacts at the local and regional levels. The main aim of the operation of this hospital is to provide quality health services to trauma patients. This EIA study identified, predicted, and outlined the beneficial and adverse impacts. The adverse impacts are considered nominal compared to the benefits. Benefit augmentation measures for beneficial impact and mitigation measures for adverse impacts are proposed in this EIA report.

Most of the adverse impacts predicted are of low significance and short term. The hospital's operation will enhance modern treatment facilities providing sufficient numbers of hospital beds; and more wards and faculty equipped with the latest application technologies, which will cure more severe diseases and be able to conduct major operations in the country. In addition, local people will obtain employment opportunities during the construction and operation phase, which will enhance the livelihood of local people.

The proponent is committed to mitigating the project-induced impact of all environmental aspects (physical and chemical, biological, social, and cultural). Apart from health services, the project will provide a number of benefits such as employment opportunities, skill training, and CSR activities. The proponent will implement proposed augmentation measures so that the proposal will bring more benefits to the community. Any activity is not effective without proper monitoring, so this report also gives a monitoring plan. The proponent has also allocated NPR 10, 00,000/- for environmental enhancement measures, NPR 68, 00,000/- for mitigation measures and NPR 58, 42,000/- for monitoring activities. The proponent is committed to implementing the environmental enhancement measures, CSR activities, mitigation measures, and monitoring plans given in this report.

11.2 Commitments

- Self-monitoring will be conducted every 6 months during the construction and operation phase to identify the impact on the environment and the report will be submitted to the concerned agency and department.
- The Environmental Management Unit will be established within the hospital
- A Grievance redress unit will be established in the hospital to resolve complains
- Infection control mechanism will be arranged in the hospital as per the criteria set by the WHO, and it will be monitored regularly and effectively
- The hospital will keep the available schedule (days and times) of specialist doctors or other doctors providing outpatient services in a visible place
- Patient charter will be displayed on the front of the hospital with the fee, procedure, and duration of the patient receiving the service from the hospital
- Inquiry and help desk will be arranged to provide necessary information
- The hospital will be senior citizen, child, and disability-friendly
- Digital technology equipment will be used in the hospital instead of mercury-based equipment

- Waste discharged from the hospital will be managed as prescribed by the Solid Waste Management Act, 2068 BS, and Solid Waste Management Rules, 2070 BS.
- An environmental management unit with environmentalists will be arranged to regularly monitor the work related to the management of medical waste discharged from the hospital
- A disaster management plan will be prepared for the information of the public in the hospital building, and safety signs will be clearly displayed inappropriate places.
- The hospital building will be equipped with anti-lightening technology. Fire extinguishers, fire reel holes, smoke detectors, auto fire alarms, etc., will be installed for fire control.
- Free treatment will be made compulsory for the needy and helpless patients coming to the hospital by allocating ten percent of the total beds. The report will be regularly sent to the Public Health Office.
- Separate entrances and exits will be arranged in the hospital for entry and exit
- Pharmacy will be established within the hospital periphery as per Pharmacy Service Directive, 2070
- A Complaint Box will be kept in the hospital in a visible place
- Tree plantation and gardening will be maintained in the hospital premise for a healthy environment

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