HILL PROJECT〜
A new community in Tohoku

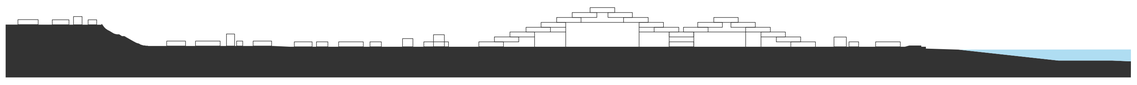
東北地方沿岸部は2011年3月11日の地震と津波により甚大な被害を受け、15,000人以上の方が亡くなり、市街地やエネルギーなどのインフラは壊滅した。被災地域の復興と今後の災害対策の両立にあたり、これまでとは異なるアプローチから都市を構築する必要がある。そこで私たちは、人口の"Hill"を中心とした5,000人規模の新しいコミュニティーを提案する。耐震・耐津波公共建物であるHillには2500 人程度が生活し、農業、畜産、水産業など様々な産業で働く人々を含む残りの2,500人はHillの周辺徒歩15分圏内に住む。Hillでは普段日常生活が送られ、住居の他に公園や商業施設なども併設される。災害時には、Hillは高台避難施設の役割を果たし、Hill周辺の人々を含む5000人全員収容し、避難生活や衛生管理、非常時の情報入手のために緊急電源も配備される。

Tohoku was severely struck by the earthquake and tsunami of 11 March 2011. Over 15,000 people lost their lives and complete urban areas and energy infrastructures were devastated. It became clear that a different approach to city making is necessary in the region, to resist future disasters and to revitalize the affected cities. Our response is a new type of urban community of 5,000 people, with one or several artificial hills at the center. The Hill, designed to withstand earthquakes and tsunamis, contains residences for about 2,500 people, and other 2,500 people would live in the surrounding district, within 15 minutes of walking distance. The Hill will be part of the everyday life, containing houses and a park, and commerce and recreational spaces inside. In the case of disaster, it will serve as a high-ground evacuation area for the people residing in the surrounding district, and a backup source of power that will guarantee energy for living, sanitary services, and communication.

Study case **ISHINOMAKI**

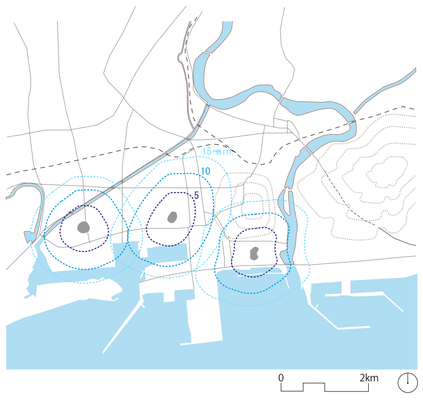
石巻市は宮城県に位置する都市である。提案地域である石巻市南部は平地が多い。漁業や北上側によってもたらされた肥沃な平野部での農業が盛んである。

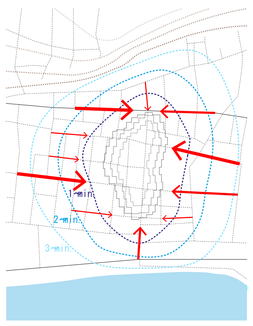
Ishinomaki is a city in Miyagi Prefecture, Japan. The proposal is located in Southern Ishinomaki, characterized by its flat topography. Economy is based on the fishing industry and agriculture, facilitated by the large fertile flat land achieved by the Kitakami river.



Urban section

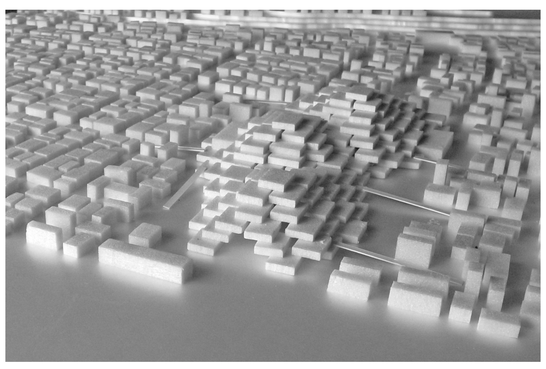
A-A' Urban section 1/2500 0 50 100m

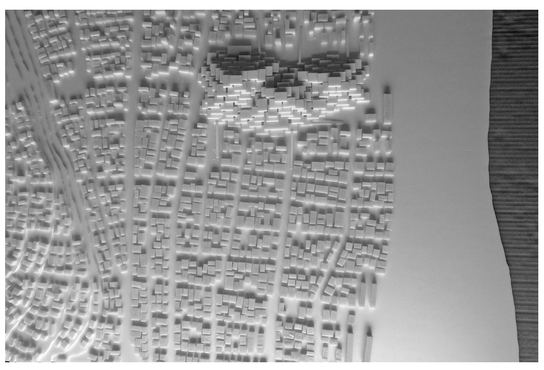


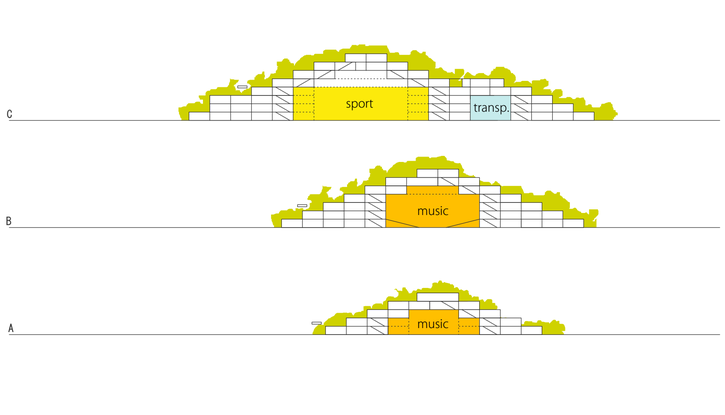


石巻市では主に平地が津波の被害に遭い、中心市街地全域を含む市内平野部の約30 %が浸水し、3000人以上の方が亡くなった。平野部の多い石巻市では、沿岸近くに複数Hillを配置し、緊急時に徒歩15分以内での避難を可能とする。図に示すようにHillへは全方位的にアクセスできるようにし、災害時の避難の際に渋滞などが生じないような計画とする。

In 11 March 2011, Ishinomaki suffered substantial damage. 30 % of the flat land in the city was flooded, which included all built-up central areas. Over 3,000 people died. Since Ishinomaki has a large proportion of flat land, we propose several Hills to be placed near the coast, so that in case of tsunami the population living in those flat areas can escape to higher ground within not more than 15 minutes walking distance. As shown in the map above, people can move to the Hill from any directions, to avoid traffic jams and facilitate a fast evacuation to the Hill.



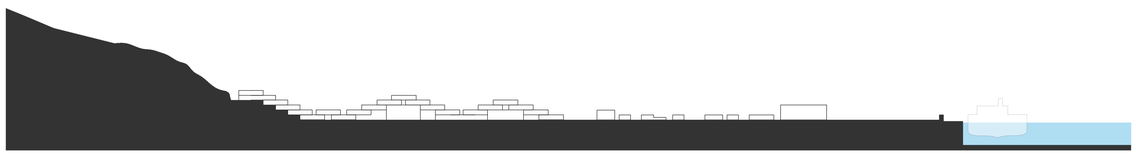




Study case **KAMAISHI**

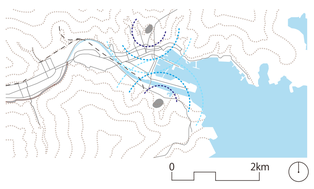
釜石は、岩手県に位置する。北上山地と太平洋に囲まれ、平地は少ない。製鉄業と漁業が営まれている。

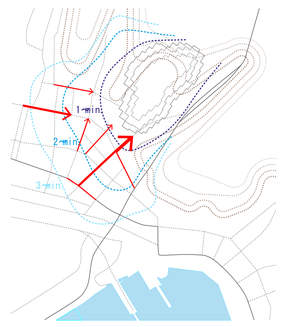
Kamaishi is located in Iwate Prefecture, Japan. It is surrounded by the Kitakami Mountain range the and the Pacific Ocean. The local economy is based on the steel and fishing industry.



Urban section

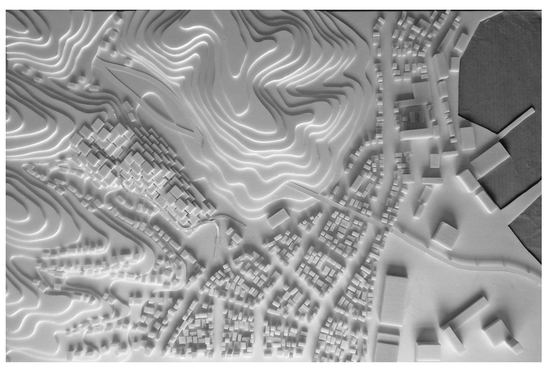
B-B' Urban section 1/2500 0 50 100m

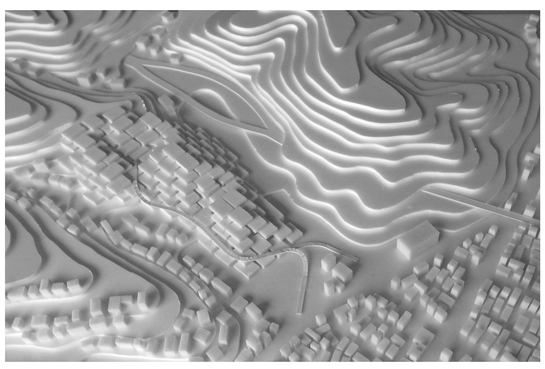




釜石市は、沿岸部まで北上山地に囲まれた典型的リアス海岸を持つ市であり、その山地の合間をぬうように津波が浸水し、800人以上の方が亡くなった。傾斜地が多く平地が少ない釜石市では、図に示すように津波浸水地域の近くまでHillが地形に溶け込むように配置され、周辺地域の人々が徒歩15分以内での避難を可能にする。

Kamaishi is a typical ria coast city with few flat land. It is surrounded by the Kitakami mountain range, which reaches up to the coast. The tsunami of 11 March 2011 threaded through the mountains and killed over 800 people. In Kamaishi, we propose to integrate the Hill in the existing topography and close to the existing tsunami prone residential areas. In case of tsunami, the surrounding population can evacuate to the Hill within no more than 15 minutes of walking distance.





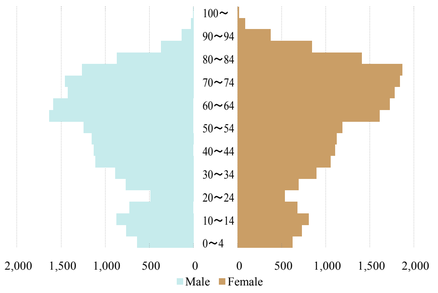
人工のHillにおける居住空間と公共空間

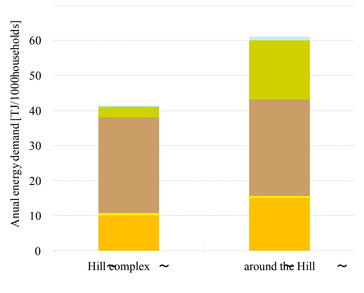
Hill内部には、映画館やホール、その他商業施設等人が集まる空間があり、Hillに活気を与え、住居や商業施設間でエネルギーが融通され有効に利用される。また、市役所や医療施設、保育所や小中学校などの教育施設、下水処理施設やごみ処理施設などが併設され、エネルギー・水・食料・防寒衣服・毛布・トイレ等のライフラインも確保し、災害時Hillに避難した際にできる限り不自由なく避難生活が送れるようにする。

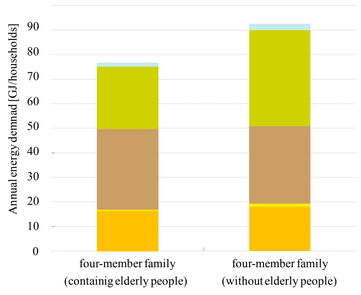
An artificial hill of houses and public spaces

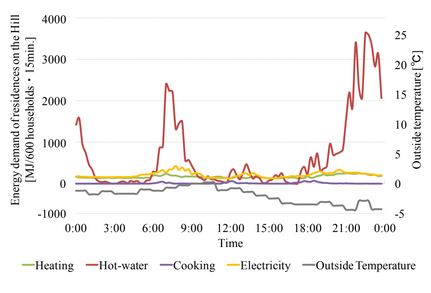
In the interior of each Hill there are public facilities such as theaters, halls, supermarkets and sport centres. They become cores of public activity that generates liveliness in and around the Hill. Additionally, energy is used more efficiently by exchanging it between residences and facilites. These Hills along the coast, designed to serve as evacuation centers, will accommodate municipal offices, medical facilities, nurseries, schools, sewage disposal and garbage incinerator plants, and ensure energy and basic services in order to reduce the inconvenience of evacuees' life.

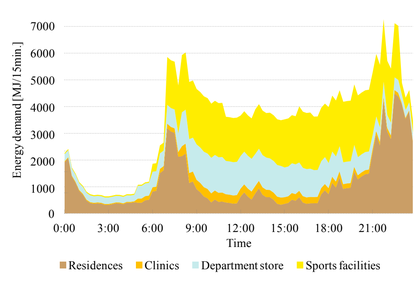
用途の多様化による効果的エネルギー融通 Mix-used community to enable an efficient energy exchange











釜石市人口分布

釜石市は、人口に占める高齢者の割合が35%と、日本全国平均の1.5倍の比率である*。高齢者を含む家庭が優先的にHillまたはその近隣に住まうことによって、災害時に円滑に避難することができる。 (*出典：総務省統計局, 平成22年国勢調査, 2010より)

Population in Kamaishi City

In Kamaishi-city elderly people consist of 35 % of the total population. It is 1.5 times larger than the national average*. In our proposal, families including elderly people live on the Hills or near them preferentially, so that in the case of disaster the surrounding population can escape onto the Hills smoothly. (*Source: The Public Management Ministry's Statistics Bureau, National census in 2010, 2010)

HillおよびHill周辺戸建住宅における生活エネルギー需要（各1000世帯）

ひとつのコミュニティーに住む5000人（2000世帯）のうち、Hillに住む2500人（1000世帯）およびHill周辺の戸建住宅に住む2500人（1000世帯）の年間エネルギー需要は上のようになる。釜石市の人口分布を元に家族構成を再現し、NHK国民生活時間調査2005とモンテカルロ法を用いて各住人にばらついた行動スケジュールを与え現実的なエネルギー需要の推定を行った。

Annual residential energy demand on the Hill and the surrounding district

This graph shows the annual residential energy demand of one community (5,000 people; 2,500 on one or several Hills, and 2,500 in the district surrounding the Hill). To make this graph first we made several family configurations from the statistical distribution of population in Kamaishi. Then we allocated a dynamic behavior schedule to each person by using the Monte Carlo method with the Data Book NHK National Living Activities Research 2005. Finally we estimated the energy demand, as shown in the graph.

高齢者を含む世帯と高齢者を含まない世帯のエネルギー需要比較

代表家族として高齢者のいる世帯と高齢者のいない世帯の年間エネルギー需要を比較すると上のようになる。高齢者は在宅時間が長いため、高齢者を含む世帯は特に冷暖房のエネルギー需要が大きくなっている。今後さらに高齢化が進むため、冷暖房のエネルギー需要が大きくなる世帯が増えると予想される。

Energy demand differences of two families with and without elderly people

This graph shows the energy demand differences between two families, one with elderly people and the other without elderly people. For the family with elderly members, cooling and heating energy demand is larger since the elderly people stay at home longer. The number of families with larger cooling and heating energy demand will increase in the future, as the elderly population ratio increases.

Hill住宅部門（600世帯1500人）の冬季代表日におけるエネルギー需要

ひとつのHillの住宅（600世帯1500人）における冬季代表日（2005年において最高気温が最も低かった1月12日）の時時刻刻のエネルギー需要の移り変わりを示したものである。特に給湯に関して、朝夕にエネルギー需要が大きいことが分かる。

Energy demand of the residences on the Hill on a winter day

This graph is a simmulation of the energy demand fluctuation of the residences on the Hill (600 households; 1,500 people), based on the temperatures of 12 January 2005, which was the day in 2005 with the coldest daily maximum temperature. We can see that the energy demand of hot-water supply is especially large in the morning and evening.

Hill内の施設を含む冬季代表日のエネルギー需要

住宅のエネルギー需要は朝夕に大きくなっており、時間帯によって大きく偏っている。日中にエネルギー需要の多い施設のエネルギー需要を組み合わせると、全体としてのエネルギー需要は比較的平準化され、エネルギーが有効に利用できる可能性がある。

Energy demand of the Hill including other facilities on a winter day

In this graph, based on the same calculations as in the previous one, we can see that energy demand of the residences is large in the morning and evening. If we combine the energy demand of residences with that of other facilities that have large energy demand in the daytime, we can achieve the leveling of the total energy and a more efficient use of the energy.

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