

双语教材

建筑科学基础

Foundations of Architectural Science

◆ 夏云 夏葵 编著

中国建材工业出版社

汉英双语教材

BILINGUALISM OF CHINESE ENGLISH BOOK

建筑科学基础

FOUNDATIONS OF ARCHITECTURAL SCIENCE

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内 容 摘 要

本书主要内容:1. 环境·人·建筑。2. 建筑科学基础:地基、基础;墙:一般构造,防水防潮,散水绿化;冬季建筑热学;隔墙·隔空气声·噪声控制;楼板·隔撞击声;阳台、雨棚及其绿化效益;楼梯·建筑防火;屋顶·夏季防热;门窗·建筑采光·窗温室生态效益;建筑变形与抗变形;表面处理;厅堂音质。

本书适用于环境艺术、城市规划、建筑学以及建筑装饰等专业学生汉——英双语教材(已在西安建筑科技大学开课 8 年,1997—2004)。

AN ABSTRACT OF THE CONTENTS

Main contents of this book: 1. Environments·Being·Architecture. 2. Foundations of Architectural Science: Ground Bases, Foundations; Walls: General Construction, Protection of Wall from Water and Moisture, Apron Greening; Building Heat in Winter; Partitions·Insulation of Airborne Sound; Noise Control; Floors·Insulation of Impact Sound; Balcony, Canopy and Their Greening Benefits; Stairs·Building Fireproof; Roof·Summer Heat Insulation; Doors/Windows·Building Daylighting; Window Greenhouse Eco-benefits; Deformation and deformation of buildings; Surface Treatments; Acoustic Properties of Halls.

This book is suitable to be the teaching book for the students of Environmental Art, Urban Planning, Architecture and Building decoration, etc. (This book has been used as teaching book for 8 years, 1997—2004, in the Xi'an University of Architecture and Technology).

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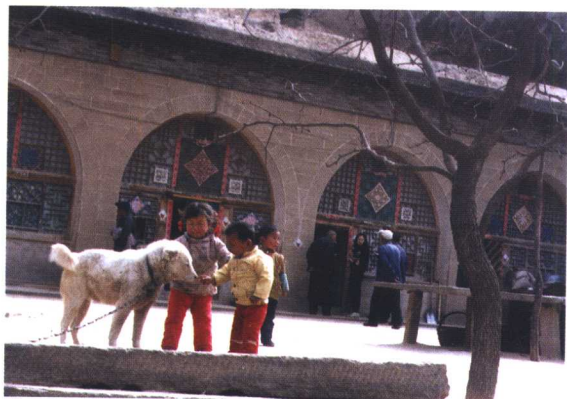
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1 环境·人·建筑

1 ENVIRONMENTS·BEING·ARCHITECTURE

1.1 环境

“环境”一词的含义很广,根据不同领域的各自目的有多种多样的划分,如:

物质环境
精神环境
政治环境
经济环境
自然环境
人为环境
生态环境等

一切科学与艺术或美学工作都应“以人为本”,注意!不是“以人为霸”。

从“以人为本”的观点来看人聚环境乃环境的中心,而建筑乃人聚环境的主体。因此,环境和建筑设计者以及规划师们都必须对建筑及其环境要有相应的了解,对相关建筑科技要有必要的掌握。

1.1 Environments

The meaning of the word “Environment” is very broad.

According to respective aims of different fields, environments have been variously divided such as:

Physical environment
Spirit environment
Political environment
Economic environment
Natural environment
Built(man-made)environment
Ecologic environment, etc.

All works of science, art and aesthetics should take “serving people as the root duty”, heed! not “take being as the tyrant”.

In the view of “serving people as the root duty”, people living environment is the centre of environments, buildings are main bodies of the people living environment. So the environment and building designers and planners must have a suitable understanding of architecture and its environment, and master the needful architectural science - technic knowledge.

1.2 围绕人类的自然环境

1.2.1 天

(1) 太阳

太阳质量为 $2.2 \times 10^{27} \text{ t}$, 约为地球质量的 33 万倍, 占太阳系总质量的 99.86%, 最主要的成分是氢占 78%, 氦占 20%。

太阳直径约为 139 万 km, 是地球直径的约 109 倍, 太阳体积约为地球体积的 130 万倍, 太阳至地球平均距离为 14,960 万 km。太阳表面温度 6000°C , 核心温度据推测为 $1000 \sim 2000$ 万 K。太阳能由其内部热核聚变过程产生, 在该过程中, 氢转变为氦, 每秒有 400 万 t 物质转变为约 $36 \times 10^{22} \text{ kW}$ 能量 (爱因斯坦质能关系 $E = mc^2$, m 为质量 kg, $C = 3 \times 10^5 \text{ km/s}$), 如此惊人巨大的能量向太空辐射, 其中约 22 亿分之一到达地球大气层外表面。穿过大气层抵达地面的能量约为 $8.5 \times 10^{13} \text{ kW}$, 这就是地球生物及矿物的最原始的能源。

太阳能是最伟大的、干净、安全、永久性可持续能源。

没有太阳就没有万紫千红的世界。

(2) 月亮

月球是地球的天然卫星, 其表面重力仅为地球表面重力的 $1/6$, 质量是地球的 $1/81$ 。月球上无空气, 无绿色植物, 月面向阳 (白天)

1.2 Natural Environments around Human Race

1.2.1 Sky

(1) Sun

Solar mass is $2.2 \times 10^{27} \text{ t}$, about 0.33 million times that of the earth, occupies 99.86% of the total mass of the solar system. Hydrogen and helium are by far the most abundant, representing over 78 and 20 percent of the solar mass, respectively.

Solar diameter is about $1.39 \times 10^6 \text{ km}$, almost 109 times that of the earth. Sun to earth mean distance is 0.1496 billion km. Solar surface temperature is about 6000°C , its core temperature is thought to be $10 \sim 20$ million K.

Solar energy is generated within the sun in a thermonuclear fusion process, hydrogen transforms into helium, every second approximately 4 million t materials convert to energy of some $36 \times 10^{22} \text{ kW}$ (Einstein mass - energy conversion law: $E = mc^2$, m : kg, $C = 3 \times 10^5 \text{ km/s}$). Within so whacking energy radiating to space, about one over 2.2 billion of the energy reaches earth atmosphere's outer surface. Through the atmosphere, $8.5 \times 10^{13} \text{ kW}$ energy reaches ground, this energy is just the original energy of earth living things and mines.

Solar energy is the greatest clean, safe and forever sustainable energy!

No sun no the world with a riot color!

(2) Moon

Moon is a natural satellite of earth. The gravity on moonscape is only one sixth of that on earth ground, moon's mass is only one

时温度高达 $130\sim 150^{\circ}\text{C}$,晚上低到负 180°C 。最近发现月球两极可能有水冰存在。

移民月球是 21 世纪地球人类计划的重大太空行为之一。美、法工程人员正合作在月球就地取材建月球建筑。一美籍华裔工程师利用美国宇航员从月球带回的尘土已试制出月球水泥样品(从地球运 1t(吨)材料到月球要 5000 万美金)。

月球是宇宙科学研究的理想基地。月球上无空气,形成不了风,故月球表面虽有很多月球尘埃,也不会飞到空间降低能见度。在月球上,天文望远镜的分辨能力可以达到原“哈勃”太空望远镜的 10 万倍以上。

月球还是一个矿物较丰富的资源地,有 60 多种矿物。

上月球搞科研,如同去南、北极搞科研一样,我们决不放弃。

月球对地球主要有列影响:

1) 维持地球正常运行

太阳系中,天体的自转与公转运行都处在相互引力场作用的动态平衡中。

设若没有月亮,地球将发生滚翻运行,四季乱序,难以生存。

over eighty - one of that of the earth. On moon, no air, no green plants. When facing sun, moonscape temperature may reach $130\sim 150^{\circ}\text{C}$,at night, may drop down to negative 180°C ,in the two poles of the moon, recently has been found there might exist ice of water.

Immigrating people onto the moon is one of the great actions of earth man in the 21st century. The engineers of America and France have been cooperatively researching to build moon buildings with local materials on moon. An American engineer of Chinese origin has successfully got the cement sample made of the moon soil brought back by the American spaceman(to carry one t material to moon will cost USD 50 million).

The moon is an ideal site for space science researches. On moon no air so no wind, although there much dust on moonscape there's no any dust flying up to reduce the visibility. On moon the distinguishability of space telescope is more than 0.1 million times that of the original Hubble Space Telescope.

Moon is also an abundant resource of mines, there are more than 60 kinds of minerals.

Going to moon to do research as that going to the Antarctic Region and Arctic Region to do research we never give up.

Moon has the following main effects on earth:

1) keeping earth normally moving

In solar system, the celestial bodies revolve round the sun and on their own axes, they are kept in dynamic equilibrium by their gravitational field acted one another.

If there were no moon, the earth would move in roll and toss, and the moving rule of the four seasons would be confused, all living

2) 潮汐作用

月亮的引力作用使地球海水不能与地球自转方向同步运行,而是相对于海底逆向而行,形成潮汐现象。

利用潮汐现象蓄水发电是一项可再生的可持续能源。

3) 地震影响

月球引力对地震也有影响,有关专家已经并一直在研究。

4) 地球人的精神生活

月亮对地球人的精神生活自古以来就扮演着很重要的角色,仅诗仙李白一人就有多篇吟月诗句。

《月下独酌》

花间一壶酒,
独酌无相亲。

举杯邀明月,
对影成三人。

《静夜思》

床前明月光,
疑是地上霜。
举头望明月,
低头思故乡。

披星戴月行路人,边疆,海岛战士们,月下歌舞儿女们,海洋作业军、民们……多少人在享受免费天灯赐予的温柔乳白的照明!环境设计师、建筑师、规划师、工程师们定能利用这盏免费天灯创造出更加美好的夜景。

things would be hard to live.

2) Tide effect

Moon's gravity makes earth sea water can't synchronously move to the direction of earth revolving on its own axis, the sea water and sea bottom move in opposite direction each other, just this action causes tides.

Using tide effect to store sea water to generate electricity this is a renewable sustainable energy.

3) Earthquake effect

Moon's gravity also influences earthquake. Relative specialists have been and are still studying the influence.

4) Earth man's cultural life

Since ancient time, for earth man's cultural life the moon has played an important role. Such as the Poetic immortal Li Bai alone had a lot of poems to sing the moon, examples:

《Drink Alone under the Moon》(引自英汉对照《唐诗三百首新译》)

Amid the flower, from a pot of wine

I drink alone beneath the bright moonshine.

I raise my cup to invite the Moon who blends her light with my shadow and we're three friends.

《Thoughts in the Silent Night》(引自英汉对照《唐诗选》)

Beside my bed a pool of light -
is it hoarfrost on the ground?

I lift my eyes and see the moon,

I bend my head and think of home.

Walkers under the canopy of the moon and stars, soldiers guarding at borderlands and islands, men and women singing and dancing under the moon, army and people of doing sea works ... so much people have been enjoying

5)有利于地球人户外夜生产与生活。

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问君有志太空否

地月浩瀚遥相邻

科技天神飞桥牵

问君有志太空否？

金帖相邀首站 moon,

娥、刚捧出桂花酒，

笑询扩建广寒宫，

备迎游客邀太空。

1.2.2 地球

(1)一般介绍

地球是地球人类起源、生存、发展的母体。图 1-1 是地球人血液中元素与地球岩石中元素关系对照表。

从图 1-1 可看出，地球人血液中的元素与地球岩石中元素的类型、含量竟达到如此惊人的同步波形！

地球表面约 67% 是水，人体重的 65% ~ 70% 也是水，这组对应百分数，再次证明地球人与地球的密切关系。

the smooth and milky lighting vouchsafed by the free sky lamp!

Environmental designers, architects, planners and engineers certainly can use the free sky lamp to create more better night environments.

5) Benefiting for earth man's outdoor night production and living.

Are You Interesting to Go Space

A vast expanse exists between the two neighbors earth & moon.

The Space God, science-technic can fly a bridge to link them.

Are you interesting to go space?

Gilt Card invites you first going to moon.

Chang'e and Wugang contribute the wine fermented with osmanthus flowers, and with smiling ask to expand the Moon Palace, so as to welcome tourists travelling through space.

1.2.2 Earth

(1) General

Earth is the matrix of earth man's origin, subsistence and development. Fig. 1-1 shows a comparison between the elements in man's blood and the earth rock. From Fig. 1-1 we can see the contents and types of the elements in human's blood and earth rock are so amazingly in step!

On earth, water has occupied about 67% of the total area of the ground, and there 65% ~ 70% of the weight of a man is water. The two correspondent percents prove that again, between earth man and earth exists close relation. So, we

所以说：“地球是地球人最伟大的母体。”
此话毫不为过。

say: “Earth is earth man's the greatest mother”
that's no any exaggeration.

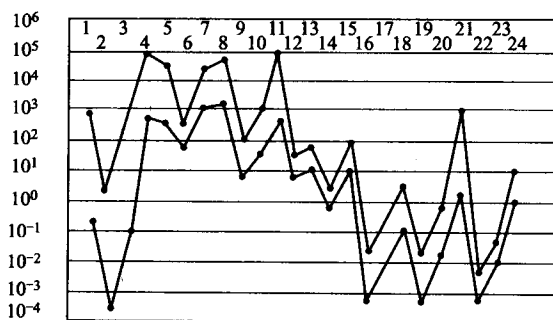


图 1-1 地球人血液元素与地球岩石元素对照表

Fig. 1-1 Element quantity relation between in human blood and earth rock

| | | | | | |
|-------|-------|-------|---------------|--------------|---------------|
| 1. 氢 | 2. 铍 | 3. 氟 | 1. hydrogen | 2. beryllium | 3. fluorine |
| 4. 钠 | 5. 镁 | 6. 磷 | 4. sodium | 5. magnesium | 6. phosphorus |
| 7. 钾 | 8. 钙 | 9. 铬 | 7. potassium | 8. calcium | 9. chromium |
| 10. 锰 | 11. 铁 | 12. 铜 | 10. manganese | 11. iron | 12. copper |
| 13. 锌 | 14. 砷 | 15. 镓 | 13. zinc | 14. arsenic | 15. gallium |
| 16. 铈 | 17. 镉 | 18. 锡 | 16. rhodium | 17. cadmium | 18. tin |
| 19. 碲 | 20. 碘 | 21. 钡 | 19. tellurium | 20. iodine | 21. barium |
| 22. 铯 | 23. 汞 | 24. 铝 | 22. rhenium | 23. mercury | 24. aluminium |

The element content of earth rock: $\mu\text{g/g}$;

The element content of human blood: $\mu\text{g/ml}$

(source: China Encyclopaedia 《Sanitary Science》)

天文学家研究,地球是太阳系中九大行星之一,太阳是银河系恒星之一。银河系有24500 亿个恒星。宇宙在约 150 亿年前一次发生大爆炸,散向各空间的炽热质团在漫长的时间里逐渐散热冷缩,演变成千千万万亿如银河系的宇宙星系。

大约在 66 亿年前,银河系又发生一次大爆炸,其后 16 亿年有若干团星际物质散落在今天的太阳系空间,逆时针方向自转并公转

Under astronomer researches, earth is one of the nine big planets in solar system. The sun is one of the fixed stars in the Milky Way System (the Galaxy). There are 2450 billion fixed stars in the Galaxy. About 15 billion years ago, an universal Big Bang happened, the red-hot masses jetted to every direction. During the long years, the jetted masses gradually lost their heat and contracted and evolved as billions upon billions galaxies like the Milky Way System.

About 6.6 billion years ago, in the Galaxy happened again a Big Bang. Some 1.6 billion years later, several interstellar (intersteller)

运行,逐渐冷缩凝聚成太阳系的行星,地球即其中之一。太阳系行星系统较定形的年代约在 46 亿年前,故迄今天文界公认的地球年龄为 46 亿年。

地球赤道半径长为 6378.245km,两极半径为 6356.863km,平均半径为 6371.2km,推算出地球总面积约为 51000 万 km^2 ,其中约 71% 为海洋面积。

中国陆地面积 960 万 km^2 ,约占地球陆地表面积 14790 万 km^2 的 6.5%。中国陆地面积中,平原只有 12%,各种山、坡、沟、洼地占 70% 以上。

(2) 地球上其他物质环境

1) 大气圈

地球表面上空有厚厚一层大气(空气)包围着,南、北两极区上空该厚度大于 2800km,赤道上空该厚度大于 4200km。

大气是混合体,其组成按干空气(不含水蒸气)体积百分比,分别为:氮 78.08,氧 20.95,氩 0.93,二氧化碳 0.03,以上四气体占总体积 99.99%,其他微量气体为:氦 1.8×10^{-3} ,氖 5×10^{-4} ,氦 1×10^{-4} ,氙 1×10^{-5} ,臭氧约为 1×10^{-6} ,氡 6×10^{-18} ,氢 $< 1 \times 10^{-3}$ 。

含有上述空气组成成分及其体积百分比的空气即为新鲜空气(洁净空气)。

masses spread in the space of today's solar system, against the hour hand direction revolve round the sun and on their own axes, gradually cooled and contracted and evolved as the solar system's planets, earth is one of them. About 4.6 billion years ago, the shape of the planet system is rather stable, therefore, astronomic field universally acknowledge the earth age is 4.6 billion years till now.

The radius of earth equator is 6378.245km, of the two poles is 6356.863km, the mean radius is 6371.2km, and the computative total area of earth is about 510 million km^2 , 71% of the total area water occupies.

Chinese land area is 9.6 million km^2 , about 6.5% of the earth total land area of 147.9 million km^2 . Within Chinese total land area, plain only some 12%, assorted (various) mountains, sloping fields, ravines and depressions occupy more than 70% of the total land area.

(2) Other physical environments on earth

1) Atmosphere

There is a very thick atmosphere around the earth ground. In the sky of Antarctic Region and Arctic Region the thickness is more than 2800 km, and of equator, more than 4200km.

Air is a gas mixture. According to the percentage by volume of dry air, the gas components includes respectively: (N) nitrogen 78.08, (O) oxygen 20.95, (Ar; A) argon 0.93, (CO_2) carbon dioxide 0.03, the above four gases occupy the air total volume 99.99%. Other microscale gases of the percentage by volume are: (Ne) neon 1.8×10^{-3} , (He) helium 5×10^{-4} , (Kr) krypton 1×10^{-4} , (Xe) xenon 1×10^{-5} , (O_3) ozone 1×10^{-6} , (Rn; Nt) radon (niton) 6×10^{-18} , (H) hydrogen

围绕地球的大气圈由对流层、平流层、电离层、散逸层等组成。

① 对流层

厚: 两极天空区 7~9km, 赤道上空 15~17km。

质量: 大气总质量约为 6 千亿吨, 相当于地球质量的百万分之一。对流层质量约占大气总质量的 95%。

对流层的气流在垂直方向与水平方向对流运动均很明显。一年四季的气象变化, 如: 风、云、雷、电、雹、雨、雪、雾、露、霜均发生在此层内, 有的如雾、露、霜则直接发生在接触地面或接近地面的空气里。

对流层发生的气象现象与地球生物关系最密切, 其中有的如飓风与台风、厄尔尼诺与拉尼娜现象等都是严重的灾害。

② 平流层(亦称同温层), 含臭氧层

在对流层外到离地 50km 处大气中有一层只有水平对流的空气层, 叫平流层。

在离地面 25km 以上的平流层内有一层厚约 30km 的臭氧(O₃)层 ozonosphere。

臭氧层是怎样形成的呢?

它是由太阳紫外线(ultraviolet rays)造成的: 该紫外线将氧分子“O₂”分裂为氧原子“O”, 随即有三个氧原子或一个氧分子与一个氧原子碰撞结合在一起, 形成一个 O₃ 臭氧分子, 众多的 O₃ 形成了约 30km 厚的臭氧层。正是太阳紫外线造成的这层臭氧层阻止

$<1 \times 10^{-3}$ 。

The atmosphere around earth ground is composed of troposphere, stratosphere, ionosphere and dissipation sphere.

① Troposphere

Thickness: in the sky up the two Poles, 7~9km, in the sky up equator, 15~17km.

Mass: The total mass of the air is about 600 billion t, near one over one million of the earth total mass. The troposphere includes some 95% of the air total mass.

In troposphere, the horizontal and vertical convective movings are notable. The weather changing in four seasons of a year such as wind, cloud, thunder and lightning, hail, rain, snow, fog, dew and frost all occur in troposphere. Within them, fog, dew and frost occur on ground or in air near ground.

Weather phenomena occurred in troposphere have the closest relation to earth living things, some of them such as hurricane and typhoon, Elnino and LaNina are heavily damaging disasters.

② Stratosphere (strato) including ozonosphere

In the space from outside of troposphere up to 50km from ground, only occurs horizontal convective air moving this air space is termed stratosphere.

In stratosphere up the 25km from ground there is an ozonosphere of about 30km thickness.

What causes the ozonosphere?

Solar ultraviolet rays cause the ozonosphere. The ultraviolet rays split oxygen molecule“O₂”into atoms“O”, then three oxygen atoms or one oxygen molecule and one oxygen atom combine to form an ozone molecule“O₃” in collision. A great many ozone molecules have formed the ozonosphere of

了太阳投向地球 99% 的紫外线,使地球生物免遭毁灭性紫外线杀伤危害。透过大气到达地面 1% 的太阳紫外线则起到消毒、灭菌、助长儿童骨骼生长(消除佝偻病)的有益作用。

保护臭氧层就是保护我们自己。

③ 电离层

地面以上 50km~100km 空间有一电离层,由太阳紫外线电离空气形成。电离层可反射无线电波传递无线电信息。

④ 散逸层或称外大气层

散逸层是最外层的大气空间,范围距地 500km~65000km. 空气极稀薄,其密度小于近地空气密度的 300 万亿分之一。

地球大气层还一直在保护地球免遭无数星体的撞击,使该星体在摩擦生热中成为陨石。

2) 天灾人祸负效环境

天灾人祸造成的负效环境是围绕人类的环境重要组成部分,对环境破坏极大。

a) 人为负效环境

① 破坏绿色世界,加剧大气温室效应

通过人类生产、生活及动植物呼吸作用大量排放到大气中的二氧化碳、水蒸气等有类似普通玻璃那样“透短吸长”的热学特性,

about 30 km thickness. Just this ozonosphere caused by the solar ultraviolet rays has stopped 99% of the solar ultraviolet rays projecting on earth, and protected earth from exterminatory kill of the ultraviolet rays. The remaining 1% ultraviolet rays through atmosphere reached ground are good rays, benefit sterilizing, killing germs and helping children's bones growing (avoiding rickets).

Protecting ozonosphere is protecting ourselves.

③ Ionosphere

Above ground 50km~100km, there is an ionosphere caused by solar ultraviolet rays. Ionosphere can reflect radio waves and pass radio information.

④ Dissipation sphere or outer atmosphere

This sphere is the outmost space of atmosphere, its confines are above ground 500km to 65000 km, here the air is very rarefied, its density is less than one over 3×10^{12} of that of the air near ground.

Atmosphere has still protected earth from bumpings of no end of the celestial bodies, made them heated by friction and become into meteoric blocks or chippings.

2) Negative effect environments by man and natural calamities

Negative environments by man-made and natural calamities are also an important component of the environments around human being, which have damaged the environments very seriously.

a) Negative environments by man

① Damaging green world, aggravating atmospheric greenhouse effect

There have been much carbon dioxide and water vapour, etc. exhausted to atmosphere by man's producing, living and breathing out

可透过太阳向地面的辐射(属短波辐射),同时又吸收地面向空间的辐射(长波辐射),使大气升温,并以长波辐射方式将大部分热量返回地面,使地球升温,这就是通称的大气温室效应。排放到大气中的二氧化碳增多是由于人们不断破坏绿色世界的结果。地表森林及其他绿色植物以及两极冰山是稳定地球气候及生态平衡的两大力量,科学家们分别称为“绿色力量”和“白色力量”。但由于滥伐森林,侵占绿色面积(建筑业是最大的侵犯户),使植物进行光合作用、释放氧气、吸收二氧化碳的性能大减。相反人类生产、生活及动植物呼气排放到大气中的二氧化碳又不断增加致使大气温室效应加剧,引起地表热胀变形,山、川、路、房受害,海水热胀升高,加之两极冰山消融进一步升高海洋水位,最高可升高60m以上,严重危及沿海城乡生存。

滥伐森林,破坏绿色世界还会导致严重水土流失,加剧洪水灾害与生态失衡。

from animals and plants. These carbon dioxide and water vapour have a thermal character of “transmitting short wave radiation while absorbing long wave radiation” like glass does, they can transmit solar radiation (short wave radiation) reaching ground while absorb the ground radiation (long wave radiation) and cause atmosphere temperature higher, emitting most heat back to ground by long wave radiation form, and causing ground temperature higher, that's generally termed “atmosphere greenhouse effect.”

Carbon dioxide has been exhausted to atmosphere more and more because the green world has been damaged by man more and more. Ground forests and other green plants and the two Poles icebergs are two great forces for stabilizing earth climate and eco-balance, scientists term the two forces as “Green force” and “White force” respectively. However, much forests denuded, much green area seized (building trade is the biggest aggressor) cause plant photosynthesis and the ability of releasing O_2 and absorbing CO_2 seriously decreased. On the other hand, the CO_2 exhausted to atmosphere more and more by man's producing, living and breathing out from animals and plants, which certainly aggravates atmosphere greenhouse effect, and causes that: ground expanding to damage mountains, rivers, roads and houses; sea level higher and icebergs melted to further rise sea level, final the sea level might be risen more than 60m which would seriously damage the cities, towns, villages in the boastlands.

Forests denuded and green area seized can also cause badly soil erosion, aggravate flood disaster and eco-balance loss

②破坏臭氧层

前已述及,在大气平流层内有一层臭氧层是保护地球及地球生物免遭太阳紫外线伤害的保护伞。但长期以来人们使用的空调、冰箱、汽车、计算机以及发泡剂、清洗剂等含有氯氟烃类物质,排放到大气中,在太阳紫外线照射下,氯氟烃分子会裂解,放出游离的氯原子,氯原子很活跃,它会从臭氧分子“ O_3 ”中拉出氧原子“O”,臭氧分子就减少(一个氯原子大约可破坏 10 万个臭氧分子)。臭氧浓度就会不断降低,以致形成“空洞”(臭氧比正常少了 75%)。地球南、北极均已发现臭氧空洞,南极臭氧空洞已大于中、美两国陆地之和,并以每年一个中国或美国陆地面积那么大扩展。虽然许多企业已有改进措施,但长期积存在大气中的有害气体还会长期地起破坏作用。

③人为水污染

在中国,生产、生活排放的污水已使全国 80% 的地表水与地下水受到污染。

④人为大气污染

我国每年生产、生活、运输排放大量有害物质如二氧化碳、烟尘、工业粉尘、加上全国 2 亿 5 千多万户的炊烟致使我国大气受到严重污染。全国城市中仅 1/3 人口可吸到新鲜空气。

② Damaging ozonosphere

As has said before, in the stratosphere, there contains an ozonosphere, a protective umbrella to protect earth and its living things against the damage of solar ultraviolet rays. But the long used air conditioners, ice boxes, autocars, computers and vesicatory, abstergent, etc. contain hydrochlorinefluor which has been exhausted much to atmosphere, under solar ultraviolet ray's action, this gas is splited and release dissociated chlorins. These active chlorins can draw oxygen atom(O) from ozone molecule (O_3) and reduce ozone moleculae, (one chlorin atom can break about 0.1 million ozone moleculae) while make ozone consistency lesser and lesser and form "ozone hole"(ozone consistency is 75% lesser than the normal consistency).

In the South Pole and North Pole, ozone holes have been found. In South Pole the ozone hole's area has been bigger than the land of China and America together, and every year is still spreading with a area like one Chinese land or one American land. Although many trades have been doing improvements, the harmful gas long having been stored in the air will do damage for long.

③ Water polluted by man

In China, 80% surface water and underground water have been polluted by the waste water drained off from producing and living.

④ Air polluted by man

In China every year much harmful matters have been exhausted into air, such as carbon dioxide, smoke, dust by producing, living and traffic, in addition, there are more than 0.25 billion homes' cooking smoke exhausted into air. The above two together have made the air seriously polluted. Only 1/3

⑤人为火灾

据记录,我国每年人为火灾不下 10 万起,例如 2000 年全国就发生 18 万多起人为火灾,损失 258 亿元人民币。

⑥核危害

人们绝难忘记 1945 年日本广岛、长崎两城市被两颗原子弹夷为平地,30 万人惨遭杀害!更多的人受到核辐射伤害!人们也绝难忘记前苏联切尔诺贝利核电站 1984 年 4 月的核泄漏悲剧,14 万人受到严重核辐射伤害,大范围生态受到严重破坏。

长期的军备竞赛,我们的地球已经遭受了几百次核爆炸污染!21 世纪核危害加剧的隐患一直存在。

⑦战争

自古以来,特别是冷兵器变为热兵器以来,战争是侵害人民生命财产、毁坏建筑及其环境、破坏生态与持续发展的最大祸首。

⑧恐怖分子的危害

⑨1966~1977“文化大革命”对我国各方面均造成了严重的危害。

⑩其他人为危害

吸毒在全球成亿计地夺去人的躯体、意志、家庭。有些吸毒者还会进行盗、骗、抢、杀等犯罪行为。

people through China can breathe in fresh air.

⑤ Fires by man

According to records, in China every year more than 0.1 million man-made fire cases occurred, such as in 2000, there were more than 0.18 million fires by man, 25.8 billion Yuan RMB lost.

⑥ Nuclear damage

People never forget that in 1945, the two cities: Fukuyama and Nagasaki of Japan were levelled to the ground by two nuclear bombs, 0.3 million people miserably killed! much more people injured (harmed) by nuclear radiation. People also never forget that in former CCCP there occurred a tragedy of nuclear leak at Ternopol nuclear power station, 0.14 million people were seriously injured by nuclear radiation, and the environment in a large area badly damaged.

During the long time armament rivalry (rivalship), our earth has been suffered the pollutions of nuclear blasts for hundreds times! In the 21st century the nuclear damage might be aggravated, this covered bane exists all along.

⑦ Wars

Since ancient times, especially since cold weapon became hot weapon, war has been the biggest chief culprit in killing people, encroaching properties, destroying buildings and environments and damaging eco-sustainable development.

⑧ Terrorists' damages

⑨ 1966 ~ 1977 "The Great Cultural Revolution" has seriously damaged all fields in China.

⑩ Other harms by man

Drug taking has deprived hundreds of millions of men's bodies, volition and families through the world. Some druggers might do

艾滋病在全球正以每天 7000 人的速率传染。我国已发现 8 种类型艾滋病感染者, 人数已超 1000 万, 多为青少年。

其他性病我国已有 600 多万人感染。

贪污腐化自古以来就是对为官担职人群中意志薄弱者的恶性污染。我国建筑业中贪污腐化是最严重之一。

上述人为负效环境已使社会环境、经济环境、政治环境、精神环境均已受到严重污染。

b) 天灾负效环境

①洪水

全球每年洪水都要使几亿人受害, 几千万间房屋受损, 几百亿美元经济损失。

中国 1998 年特大洪水为主的自然灾害中, 3.5 亿人次受害, 死 4000 多人, 塌房 558 万间, 损房 1205 万间。经济损失 3000 多亿元。

②地震

地震可以说天天有。20 世纪地震死亡人数已逾百万, 一次死 10 万人以上的有 4 次(中国占 2 次)。最惨痛的是 1976 年 7 月 28 日中国唐山 8 级大地震, 死 24 万 2 千人, 伤 14 万多人, 全城房屋除极少数外几乎全都倒塌, 财产损失 100 多亿元。

crimes such as pilfering, diddling, snatching and killing.

AIDS has been infectioning sufferers with the rate of 7000 persons per day. In China have been found sufferers of eight types of AIDS. The sufferers have been over ten million persons, most of them are teenagers(youngsters).

In China, the sufferers of other venereal diseases (V. D) have been exceeding six million personae.

Corruption since ancient times has been still a vicious pollution to the weak-willed officers. Corruption in building trade is one of the most serious ones through China.

The above man-made negative environments have made social environment, economic environment, political environment and psychic environment polluted seriously.

b) Negative environments by natural disasters

① Floods

Floods through the world every year jeopardize hundreds of millions people, destroy tens of millions houses and make tens of billions USD lost in economy.

In 1998, China had a king-size(outsize) flood, 0.35 billion person-time damaged, more than 4000 people killed, more than 5.58 million houses collapsed, more than 12.05 million houses damaged, more than 300 billion Yuan RMB lost in economy.

② Earthquakes

Earthquakes occur every day. In 20th century there were more than one million people killed by earthquakes. Four of those earthquakes were more serious, in each of the four, more than 0.1 million people killed(two of the four occurred in China), the deepest grieved one occurred on July 28th 1976, in