of adjustable devices (venetian blinds, external louvres and the like) when these are fitted, to see whether this use agreed with the expressed opinions.

The samples will be selected to correspond to such categories as :

(*i*) summer and winter observations

(*ii*) air conditioned or naturally ventilated rooms

(*iii*) normal glass and reflective glass

(*iv*) "attractive" and "unattractive" outlooks

(*v*) heavy construction with small windows and light construction with large windows

(*vi*) residential and commercial buildings.

Workers in windowless environments will also be included as far as possible.

As a result, it is hoped to learn more about the apparent preference which most people have for an environment with some visual contact with the outside world. If this can be done, perhaps some more definite criteria can be established for sun penetration (or its prevention), outlook, and "visual contact", in qualitative terms. Once these matters are understood, the opportunity will arise for someone to quantify the effects into, perhaps, a "view index".

Appendix.

The Determination of Sun Penetration

Solar penetration is a particularly clumsy subject to try to represent in a simple way, because there are so many variables. The solar position varies with the time of day and time of year, and with latitude of the place. Then the shaft of sunlight which enters a room is three-dimensional, and its characteristics are different for each orientation of the building. Nevertheless the answer can always be calculated (very precisely, of one uses the techniques of the navigator or astronomer). There should be no mystery about the trigonometry, since the elements of it were known to some of the oldest civilisations (Ref. 4) but for design purposes it is much too unwieldy. A number of simple graphical and tabular methods have therefore been produced (Ref. 5).

The simplest way of presenting the necessary information is in the form of a table showing the altitude and bearing of the sun for each hour on a number of dates through the year. A table should be produced for each city, and this is now done by entering the latitude and longitude of the place in an existing computer program. The designer then uses the tabulated figures for whatever purpose he requires.

Graphical presentations are often more familiar to the designer working on a drawing board. In the usual sunpath diagrams, the hemisphere of the sky vault is represented either in plan (orthographic projection) or in a downward perspective (stereographic projection) or in a distorted plan where the circles of altitude are uniformly spaced (equidistant projection). The path of the sun is drawn on the projection for each of several dates, and the time of day is also marked on the diagram. For merely determining the solar position, the diagrams offer little advantage over the tables. However for evaluating shading devices it is a simple matter to make "shading masks" for any type of horizontal or vertical projections, which can be laid over the sunpath diagram and indicate immediately the times during which the sun is excluded.

Sunpaths can also be represented in "elevation", and in this form are used to examine the view through a window from a point in the room. If the sunpath crosses the visible part of the sky, then the sun will be seen during the hours intercepted on the sunpath line. Two forms of projection are usual: a perspective of the interior (which requires a separate stereographic projection of the sunpath for each direction of viewing) or a projection of the sunpaths on to a cylindrical surface (which produces a distorted perspective of the room rather like a Waldram diagram, but needs only one set of sunpaths for any city). These techniques are more appropriate if one point within the room is considered to be critical, than for a general appraisal of a sunshading system.

If it is accepted that some sunlight may penetrate a room, but its extent (in time and in area of room covered) has to be examined, then an analysis can be made using a computer program called SUNPENET developed by the author for this purpose. The input comprises the geographical location and timezone of the place, dimensions and orientation of the room, its windows, and the overhangs outside the windows. As set up at present, it will accept none, one or two windows in each of four walls, with an overhanging eave on each wall if required. The program prints out a table of solar positions for the place, for reference purposes, and prints on the line printer a plan and four elevations for each of a number of selected dates. On each plan or elevation are shown the corners of the patches of sun which are admitted, identified for each hour of the day.

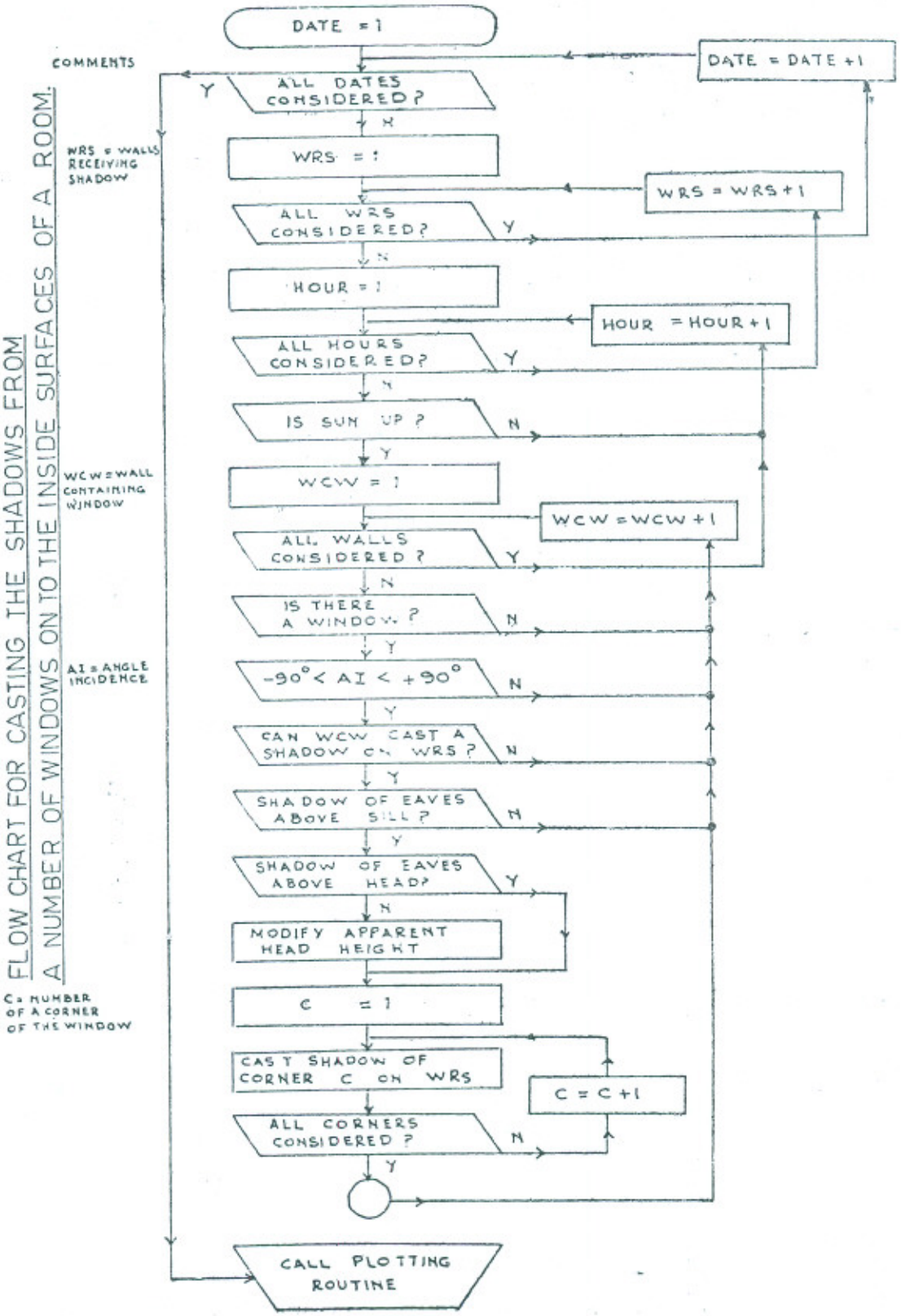
The calculation of the solar position follows usual theory. For simplicity, the values of declination and equation of time for each of twelve dates are included in the program as data. The solar hour angle (SUNH) is calculated as (hour-timezone+longitude/15+eqn. of time/60)* 15 degrees. Then the solar altitude and bearing are calculated from the solar hour angle, declination and latitude using (Ref. 6).

sin (alt)=sin (alt) sin (dec)+cos (lat) cos (dec) cos (sunh) and sin (brg)+sin (sunh) cos (dec)/cos (alt).

The dimensions of the room and windows are then read in, and the co-ordinates of the window corners are stored in two ways; relative to their wall, for use in drawing the elevation of the wall, and in three dimensions relative to the fixed origin of the room, for use in calculating shadow positions.

The calculation of the shadow positions on a wall follow the procedure indicated in the flow chart (Fig. 1). For convenience, if it is possible for a point to cast a shadow on to the plane of the wall being considered, the shadow position is calculated and passed on to the plotting routine, which discards values which are outside the actual limits of the wall. This check could have been included in the calculation routine.

The plotting routine selects the largest reasonable scale to which each view can be drawn on a 10″+10″ space (starting at 2 feet to the inch or 4, 6, 8 feet etc. as necessary) and uses elements of one printer character each to produce lines or symbols to show the outline of the surface, position of windows, and position of the corners of the shadows. The output could be transferred to a digital plotter, with better appearance and greater accuracy, but for most purposes the extra accuracy would not justify the additional cost.


FLOW CHART FOR CASTING THE SHADOWS FROM A NUMBER OF WINDOWS ON TO THE INSIDE SURFACES OF A ROOM.
COMMENTS
WRS = WALLS RECEIVING SHADOW
WCW = WALL CONTAINING WINDOW
AI = ANGLE INCIDENCE
C = NUMBER OF A CORNER OF THE WINDOW
DATE = 1
DATE = DATE + 1
ALL DATES CONSIDERED?
WRS = 1
WRS = WRS + 1
ALL WRS CONSIDERED?
HOUR = 1
HOUR = HOUR + 1
ALL HOURS CONSIDERED?
IS SUN UP ?
WCW = 1
WCW = WCW + 1
ALL WALLS CONSIDERED ?
IS THERE A WINDOW ?
-90° < AI < +90°
CAN WCW CAST A SHADOW ON WRS ?
SHADOW OF EAVES ABOVE SILL ?
SHADOW OF EAVES ABOVE HEAD?
MODIFY APPARENT HEAD HEIGHT
C = 1
CAST SHADOW OF CORNER C ON WRS
C = C + 1
ALL CORNERS CONSIDERED ?
CALL PLOTTING ROUTINE
Y
N

It is necessary to join up the corners of the un-patches by hand, and in this procedure t is helpful to use different colours for ifferent hours. The computer program ould be extended to draw these connecting ines, although on the line-printer this could esult in rather a confusing lot of symbols.

The program is being extended to cast he shadows from a single building on to a lane (which is the simplest case of outside hadow-casting), and from a group of uildings on to each other (which is a little iore complicated, but is important in xamining the shading of parts of one building y another).

Another method of determining the shading f one building by another has been developed y Ballantyne at the C.S.I.R.O. Division f Building Research, Melbourne (Ref. 7). his makes use of a computer program reviously developed by the Division which raws perspectives of a group of buildings om any selected position. By selecting the un's position as the viewpoint for the per-pective, a separate perspective is drawn for ach time of day, showing exactly what parts f the buildings the sun "sees".

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SOLAR CHARTS AND SUNBREAK PROTRACTOR FOR DESIGN OF SHADING DEVICES

The Building Research Station has published booklet which describes methods of drawing olar Charts and making Sunbreak Protrac-or. It is supplied with a set of Solar Charts om latitudes 22°N to 36°N at 1° interval long with a Sunbreak Protractor on trans-arent polythene for the facility of users. The use of protractor is explained in some detail with the help of a few typical examples for the benefit of the users. The booklet entitled "Solar Charts and Sunbreak Protractor for Design of Shading Devices" is available at a nominal cost of Rs. 2.00 *only from the Government Book Depot, Lahore.*

Influence of Standardization on Productivity

By M. H. ZUBERI

At the time of independence Pakistan's economy was almost entirely based on agriculture sector. Efforts have been made to make the country self sufficient in consumer goods making the country nearly self-sufficient in consumer goods and the agriculture sector is no longer the only base of our economy. Industry also contributes, now, substantially towards the economy of the country.

It is extremely important to examine and analyse now, our performance in the industrial sector. Are we getting a satisfactory return from the huge investment in the industrial sector from loans and our own hard earned foreign exchange? Unfortunately the answer to this question is not very encouraging. There are several factors such as poor factory planning, lack of scientific management and production control, unsound production tooling equipment, inefficient use of machines, conventional and unscientific work methods etc., which can be held responsible for a low index of industrial productivity. All these factors are limited in application to individual concerns. Of national importance is the lack of standardization of raw material and the products. This is a problem which can only be solved at national level.

The object of standardization is to reduce the varieties of raw materials and products in order to minimize the complexities of a production organization because of large varieties of production machines and tooling equipment, and complex production planning and control due to large variety in production. The standardization is even more important at this stage when we are stepping into the second phase of industrialization, *i.e.*, the manufacture of light and heavy machinery of advanced technical nature.

The country is now faced with a dual problem as regards the industrial growth, firstly, maintaining the existing industrial facility, and secondly, establishing new industries. Most of the machinery and industrial equipment imported during fiftees will need replacement during seventees. With limited capital resources the future industrial planning must be very careful and it is to be ensured that the capital investment yields adequate return to the country.

The efforts should not only be limited to capital investment but should also extend

towards the achievement of higher productivity, an index of gauging the output in the form of added value in comparison with the input to the industry in the form of capital investment. The country has invested about 4000 crore rupees since independence in the industrial sector and the added value of industrial products is only about 600 crore rupees annually, which is very low as compared with the performance of industrial concerns in U.S.A. and Europe. For example, the Ford Motor Company Dearborn, U.S.A., with a capital investment of 277 million dollars produced about 2 million cars in 1963. The total value of output was 3200 million dollars against an input of 1350 million dollars in the form of materials and services, thus giving an added value of 1850 million dollars which is more than 6 times the capital investment. Similarly Volkswagen-wrk AG Wolfsburg, W. Germany, achieved during 1963, 7 to 1 ratio between annual gains to capital investment. These achievements are mainly due to the large production volumes which make it possible to use the machines more efficiently by applying high production tooling equipment and maintaining a high productive efficiency by modern industrial management techniques. The overall performance of the entire industrial sector in our country shows a ratio of about 1/6 to 1 between the capital gains through industrial production and the capital investment. There are many factors responsible for the low productivity, the one of concern here being the lack of standardization or variety reduction which will be discussed here separately for materials and products.

Material Standardization

From raw material point of view our industry can be classified in two major categories, *i.e.*, the industry using indigenous raw material and the industry using imported raw materials. The problem of quality variation is more acute for the second category because of the frequent change of the sources of supply which is unavoidable due to the shortage of foreign exchange. The different countries are following different specifications for the materials and it often becomes difficult to choose, with the new supplier, a correct equivalent of the material being previously used. Iron and steel, in various forms, are the major raw materials being imported. Hundreds of millions of rupees worth of foreign exchange is spent every year on these imports. The only solution for maintaining a consistent standard is to utilize our own resources and set up steel plants in the country, using indigenous ore.

Iron and steel plants based on Pakistani ore may yield products slightly more expensive than the imported ones; but keeping in view the interest on foreign loans and the difficulty in getting materials of right specifications, there is no other solution except the manufacture of iron and steel from Pakistani ore. It will then be possible to maintain consistent raw material standards. The material losses and increased production cost due to reorientation of the product design and the manufacturing processes with changes in material characteristics will, then, be greatly reduced. The same is true for other imported materials, metals and alloys in particular. Efforts should be made to discover and use our own resources so that consistency is maintained in the material standards.

Product Standardization

The importance of a uniform system of weights and measures needs no explanation.

This has been accepted at national level that the country will adopt the metric system of weights and measures'. Measures should be taken to adopt this system as early as possible, because the complications in changing over to the metric system will multiply with the lapse of time. Masses should be educated through radio and press to be familiar with the system. The new industrial machinery imported into the country should strictly be in accordance with the system of weights and measures we are going to adopt.

The products of industry have a very wide spread. Of special significance are the products of engineering industry. These products can be divided in the following classification :

1. Agricultural equipment,
2. Transport equipment and
3. Industrial equipment.

The products of heavy engineering industry are not included in this discussion. Each one of these categories includes a large number of items. Examples have been quoted from each category.

1. Agricultural Equipment

The agriculture sector has the greatest importance in our economy. Diesel engines, pumping sets, tractors, sprayers and agricultural implements are finding an increasing use in the farming. Deisel engines and pumping sets for our needs are mostly produced within the country. There are hundreds of producers, producing small quantities in the individual concerns. Most of the producers are not even familiar with the concept of performance and efficiency tests and the principles of interchangeability, because they cannot individually afford to hire the services of qualified personnel. The small producers should be encouraged to join together and form bigger organizations where the services of qualified technical personnel can be utilized for improvement in design and production techniques and better machine utilization, thus achieving better quality at lower cost of production.

At present our demand is about 7000 to 10,000 tractors annually in West Pakistan only. The demand is expected to increase to 20,000 tractors annually after 1975. In East Pakistan the demand is much less because of smaller individual land holding and a different climatic condition. Most of the demand is for tractors of 45 hp. to 60 hp. output. Unfortunately, a large number of makes of tractors are being imported which has created problems of maintenance due to difficulties in getting spare parts of all the makes. The industrialist is hesitant to develop spare part industry simply for the reason that there is a very wide range of these parts each being in demand in small quantities. A survey should now be conducted to establish the most popular two or three different makes of the tractors among the farmers and in future only these tractors should be imported and manufacturing plants should be set up in the near future of not less than 10,000 tractors per year output each so that the manufacture can be carried out on mass production basis giving lower cost of production per tractor. Same policy should be followed for other agricultural equipment and implements so that hundreds of million of rupees of foreign exchange can be saved annually being spent on the import of agricultural equipment.

2. Transport Equipment

The transport equipment also needs special attention as this is another head under which

more than fifty crore rupees worth of equipment is imported annually. Cars, Jeeps, Trucks, railway locomotives, motor boats and motor launches have been imported during past ten years in dozens of different designs. Same variety dispersion is also true in the case of military vehicles. Only the maintenance involves large capital investment in spare parts as a certain minimum inventory has to be maintained for each type of vehicles. So one design should be standardized in each class of vehicles by the engineering experts from civil and military organizations. Manufacturing plants can be set up as the demand figures for most of the classes of vehicles are already fairly large and is expected to be more than twice the present demand by 1980.

3. Industrial Equipment

Machine tools for engineering workshops, machinery for textile and jute industries, material handling equipment are another big head of imports. Some of these items are being locally manufactured at a small scale. Big plants for the large scale manufacture of the selected designs of these equipments can be economically feasible.

Conclusion

Standardization of materials and products will lead to possibility of economic manufacture of the products of engineering industry which will greatly reduce the burden on foreign exchange. Consistent material standards demand for an immediate construction of mills based on our own mineral resources. Overall economy and not the apparent economy of individual plants should be the consideration for taking decisions in this respect.



PAKISTANI ENGINEER HONOURED

Mr. Mazharuddin, P.R.S.E., B.Sc. (Eng.), C.Eng., M.I.C.E., Deputy Chief Engineer / Bridges, Pakistan Western Railway has been elected as a Member of the Institution of Civil Engineers (London) on the 21st of July 1970.

Mr. Mazharuddin joined the Pakistan Railway Service of Engineers as an Assistant Executive Engineer in 1947 and has, since, held various important assignments both in Field and Office in Pakistan Western Railway as well as Pakistan Eastern Railway. From June, 1969 to December, 1969 he was attached to the British Railways under Colombo Plan Fellowship for training in Prestressed Concrete Bridge Design and Construction.

Mr. Mazharuddin has long associations with the West Pakistan Engineering Congress. He has served the Congress as a Member of the Executive Council 1962-63 and as Vice-President for 1968-70. He has been serving on the Board of Editors of *The Engineering News* since 1968.

Soil Surveys and their uses in Town Planning and Siting and Design of Buildings

Muhammad Alim Mian and Robert Brinkman*

Soil survey reports and maps are of use not only for agricultural planning and development, but also for integrated regional planning of urban and industrial areas in an agricultural environment.

Prime agricultural land is of limited extent, and is an irreplaceable national resource. Once used for housing or industry, it has become permanently lost to agriculture. It commands a high price per acre, but its economic value to the country for agriculture is still higher. At the other end of the scale, there are areas of land not economically reclaimable for agriculture. These are low-priced and their economic value for agriculture is nil. Part of such areas, for example those lying barren at present between Lahore and Sheikhupura, can be used for industrial development. Some special measures are needed for their use by industry or for roads, but these are not especially expensive.

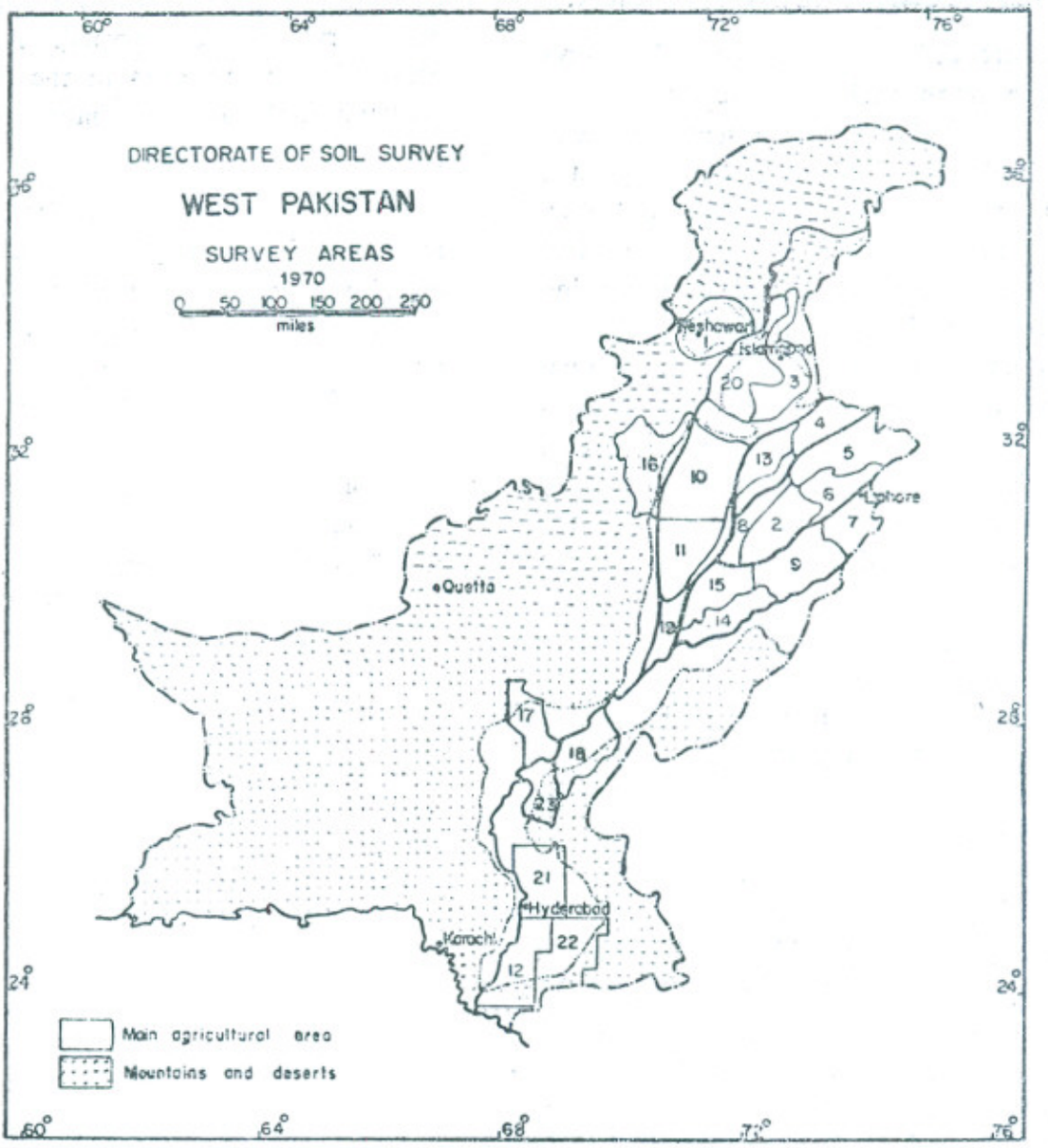
Soil maps and reports can also be used to immediate advantage in the planning of urban and industrial areas and the building of structures or roads. Information is contained in them on the location and extent of soils and materials suitable for location of buildings, for fill, for brick making, or for use as building material. Information is also contained on the problems and special conditions that might make building and urban or industrial development undesirable in specific areas. Use of reconnaissance soil surveys can improve the quality and speed of planning, but does not eliminate the need for detailed site inspections.

INTRODUCTION

Nature of soil surveys

Each soil unit is a particular kind of landscape. It is defined by its external features like landform, relief and drainage and by internal characteristics such as number, kind and arrangement of horizons or layers that make up the soil profile. The colour, texture, structure, consistence, chemical reaction, organic matter, kinds and amounts of minerals present, porosity and the presence

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	million acres		million acres
1. Peshawar Vale	2.20	13. Sargodha	1.47
2. Lyallpur Area	2.19	14. Multan South	1.65
3. Rawalpindi Area	2.33	15. Multan North	1.73
4. Gujrat District	1.44	16. Dera Ismail Khan	2.30
5. Gujranwala Area	2.80	17. Jacobabad	1.47
6. Sheikhupura Area	1.52	18. Ghotki	1.49
7. Lahore District	1.41	19. Muzaffargarh	
8. Jhang Area	2.07	20. Campbellpur	
9. Sahiwal District	2.70	21. Hyderabad	
10. Thal North	3.93	22. Badin	
11. Thal South	2.44	23. Khairpur	
12. Thatta East	2.17		

of salts and alkali help distinguish the horizons. Most of the characteristics that identify soils can be determined in the field. A few can only be determined in the laboratory.

There are different kinds of soil surveys depending upon their purpose and on the scale of mapping. At present the Soil Survey Project of Pakistan is carrying out a reconnaissance soil survey. In the survey reports, the individual soils are described and classified in detail, but the mapping units shown on the maps are soil associations rather than individual soils. The individual soils could be mapped only in detailed surveys. The mapping units are described in detail with respect to the component soils, their relative proportion, position in the landscape and the important characteristics which can be used for identification in the field. The reports also contain descriptions of the use and development possibilities for each soil. Different soils may have very different development potential.

Organization and progress

Basic soil surveys are at present being conducted throughout the country by the Soil Survey Project of Pakistan. The Project is headquartered at Lahore and has two Directorates, one in East Pakistan and the other in West Pakistan. The West Wing Directorate is also centred at Lahore. Since the inception of the Project until mid-1970, an area of 38 million acres has been surveyed and reported in West Pakistan. Reports have been issued covering 29 million acres of this area ; reports for 9 million acres are in press. The areas covered so far (map) include all or part of the districts of Peshawar Mardan, Rawalpindi, Hazara, Jhelum, Gujrat, Sargodha, Sialkot, Gujranwala, Sheikhupura, Lyallpur, Jhang, Lahore, Sahiwal, Multan, D.I. Khan and parts of Sukkur, Jacobabad and Thatta. The part of Thal within the districts of Mianwali, Sargodha, Muzaffargarh and Jhang has also been surveyed and reported. At present, fieldwork is in progress in the districts of Hyderabad, Nawabshah, Khairpur, Muzaffargarh and Campbellpur.

Soil survey information for the areas mentioned has been produced in the form of soil survey reports. Each report contains a set of maps showing the geographic location and distribution of the various kinds of soils, land capability associations, land use and landforms. The soil survey reports are available to all government and semi-government departments and organizations from the Soil Survey Project, Directorate of Soil Survey, West Pakistan, Ismail Aiwan-e-Science, Ferozpur Road, Lahore-16.

Interpretation of soil survey data

Reconnaissance soil surveys are of great use in the development of agriculture—but the natural classification of soils which is based on the soil properties enumerated above makes it possible to use soil surveys for many other purposes : for example in irrigation projects, communications, town planning, architectural planning, and siting of industries. Certain soil properties are correlated with the engineering properties of soils. In particular, clay content and its shrink-swell characteristics, water permeability, content of salts, depth to bedrock, drainage and position of the soil in the landscape, all influence the suitability of soils as a base for foundations of buildings and roads.

For example, a soil rich in montmorillonite clay has a high capacity to shrink and swell with changes in moisture. This shrink-swell

process can damage pipelines, roads and even reinforced concrete foundations of buildings. On the other hand, a soil with this property often has a high level of natural fertility and is very well adapted for growing certain crops. Conversely, a soil rich in sand has a low water-holding capacity and low fertility and therefore is usually poorly suited for plant growth, but it is well suited for structural foundations, and can also serve as a source of building material. Basic soil survey, in which the whole range of soil properties is taken into account, lends itself to interpretation for many uses.

Soil interpretations involve physical and economic analyses of the alternative opportunities available to the users of the land. They indicate capabilities of the soils for agricultural use, adapted crops, opportunities and limitations for various management practices, and possibilities and problems in non-agricultural uses. Though agriculture is the main use of land in terms of area, yet soil survey interpretations for buildings, roads and other town requirements can also be of great economic importance.

AGRICULTURAL LAND CAPABILITY AND TOWN PLANNING

Limited area of prime agricultural land

It is a matter of common knowledge that soils differ from place to place and that they range from very good to very poor for agriculture. The agricultural value of land may range from a few Rupees to thousands of Rupees per acre in an area, depending upon the nature of the soils. The characteristics that make a particular soil unsuitable for agriculture do not also render it unsuitable for other uses (such as siting towns and industries) in many cases. For example, shallow soils on hard rock or dense saline-alkali soils are almost worthless for agricultural ptoduction, but such soils can be used for siting towns and industries with great economic advantage.

Land is a natural resource that is limited in extent. Human needs are creating greater and greater demands on land for various uses. These uses are competitive. Generally, the agricultural use of land is sacrificed to urban and industrial uses. When land is put to urban or industrial use, it is rendered more or less permanently unfit for agricultural use, for two reasons : very heavy investments are made in preparing land for industrial and urban purposes ; and secondly, some soil characteristics are drastically changed in this process. This explains why old habitation sites and abandoned airstrips are generally lying out of cultivation even where they are surrounded by very good agricultural land.

It must be emphasised that nature has taken thousands of years to create good and bad soils. As an example, it took nature more than ten thousand years, through certain soil forming processes, to produce the stretch of excellent agricultural land which now is covered by the Shadman Colony and F. C. College, Lahore. Similarly, it took nature a long time to create by another, different, soil forming process a large stretch of land extending from near Shahdara to Sheikhupura which is not suitable for economic agricultural use. But this latter land is well suited for certain non-agricultural uses. If prime agricultural land is diverted to other uses, therefore, this is a permanent and irreparable loss of agricultural potential.

Land use policy on a conservation and economic basis

As a matter of principle, soils well suited for plant growth should remain available for

agricultural production, whereas soils not favourable for plant growth may be considered for non-agricultural uses such as housing, roads, or industry. Advanced countries of the world observe this principle for siting industries and townships under an overall policy for the proper use and conservation of natural resources. The same policy can also result from long-term economic planning. Where factors such as proximity to highways, railways or markets do not distort the basic price relationships, land suitable for agriculture is more expensive and would not be sacrificed for non-agricultural uses, while land not suitable for agriculture is generally low in value and, therefore, would be preferred for non-agricultural uses. These points already bring out the need for a land use policy at a national level which should guide and influence the most economic use of the land resources of the country: on the one hand by stimulating the establishment of industry and housing on non-agricultural land; and on the other by zoning regulations protecting the prime agricultural areas.

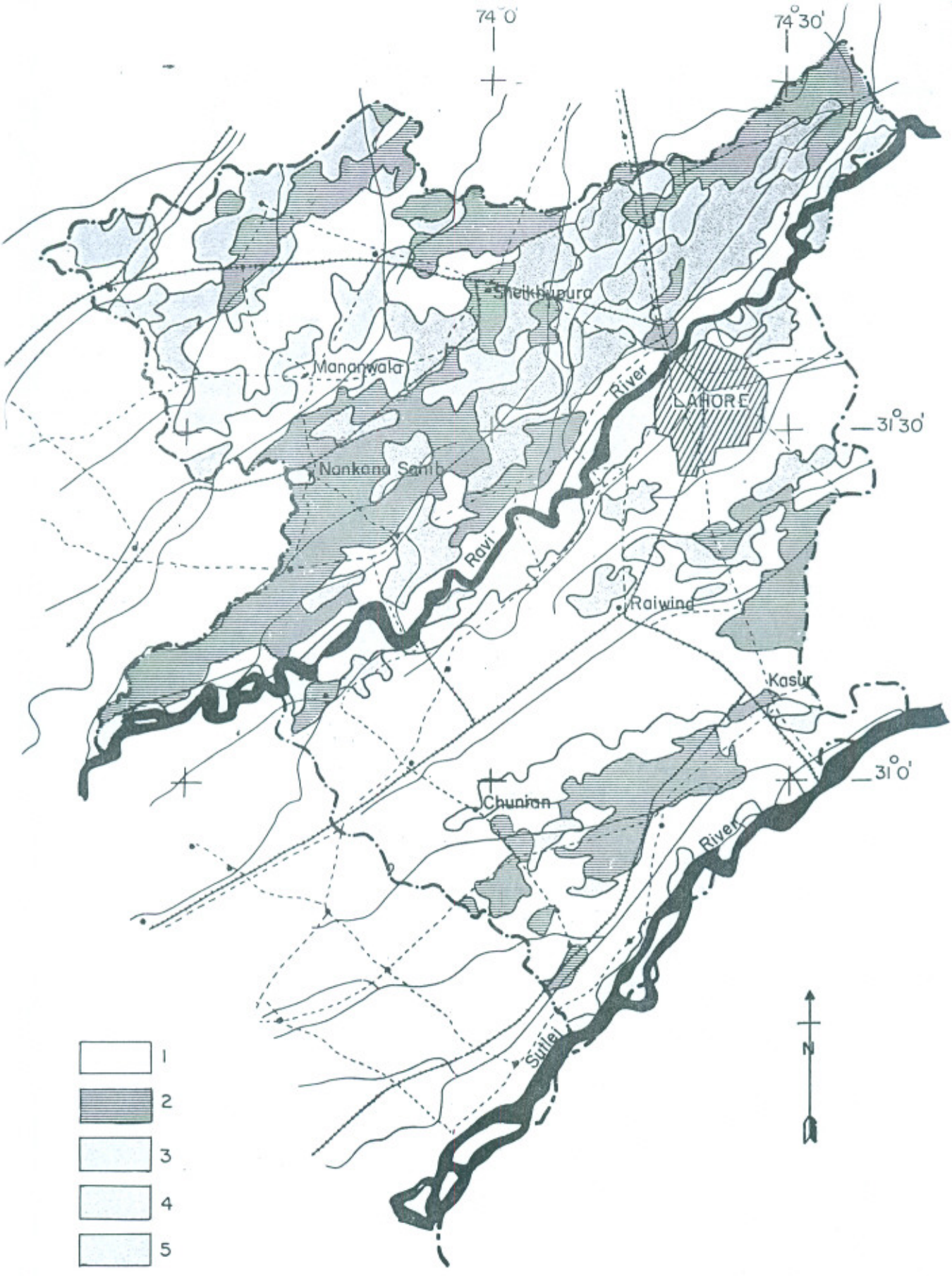
Once an area has been earmarked for siting an industrial or residential township, its further parcelling into building blocks, industrial areas, parks and playgrounds can be guided by the same principle of proper land use in order to realise the best results of town planning. Soils most favourable for plant growth can be set apart for parks and playgrounds and the other soils can be used for industrial establishments. In hilly areas, the extent of level, deep, fertile soils is generally limited. In modern town planning such areas are earmarked for public parks and playgrounds, whereas houses are sited on sloping and comparatively unfavourable soils for plant growth.

Local examples

In some places near Lahore economic forces have already started to influence the proper use of the land. For example, sizable areas of agriculturally unsuitable soils have recently come under industries near Muridke and along the Shahdara-Sheikhupura Highway. This highway bisects a large tract of similar soils extending many miles to the northeast and southwest in District Sheikhupura, along the northwestern bank of the Ravi River. The greater part of this vast tract of land comprises soils not suitable for agricultural production. Associated with these are somewhat better soils which can be reclaimed and then used for agricultural production.

On the other hand, the presence of a large barren area which is not economic for agriculture near to a city, lowers the quality of the living environment, since it contributes vast amounts of dust to the atmosphere and accentuates the extremes of temperature even in the city. Properly developed for industry, as locally along the roads from Lahore to Sheikhupura and Gujranwala, this land is partly covered and less dusty.

First-class agricultural land immediately around Lahore city has an extremely high economic value, since it can be used to provide fresh fruits, vegetables and milk to the city quickly and at very low transportation cost. Such land, in intensive horticulture, can produce a gross income of the order of Rs. 10,000 per acre per year, about ten times the gross product of land far from cities. The economic value of such land for horticulture is of the order of Rs. 50,000 per acre. In addition, areas of intensive horticulture can serve as green belts, improving the quality of climate and environment of the city.



LAHORE AND SHEIKHUPURA

GENERALIZED DEVELOPMENT POSSIBILITIES

0 10 20
miles

LAHORE AND SHEIKHŪPURA DISTRICTS
GENERALIZED DEVELOPMENT POTENTIAL
LEGEND

POSSIBLE DEVELOPMENT

		Agricultural	Urban and Industrial
1	light green	Intensive vegetables/fruits/milk/ fodders for urban use. Green belt.	possible but wasteful.
2	dark green	Intensive horticulture/ agriculture. Green belt.	possible but wasteful.
3	brown	Reclamation for general agriculture.	urban development. Suited for parks with reclamation.
4	blue	Fodders/milk (winter only)	not practical for buildings. Source of sand.
5	red	Not practical.	not practical for buildings. Good source of sand.
6	purple	Not economic	Industrial development. Good foundation if covered and provided with minor surface drains. Not suited for parks except after excavating about 3 feet.
7	hatched	Urban land	

The principle of proper land-use requires that the expansion of Lahore city towards the south and southwest on agriculturally excellent land should be arrested and that new development be diverted across the Ravi River on to soils worthless for agriculture. This would require some additional facilities like one or two more bridges across the Ravi and a few miles of metalled roads, but this would be offset by the tremendous savings in prime-quality agricultural land. Planning of new towns or expansion of existing ones can thus be guided by information on the nature and distribution of soils that is furnished by soil surveys.

A map showing generalized development potential of Lahore and Sheikhupura districts is attached as an example. The reconnaissance soil surveys of these two districts (Ashraf Ali et al., 1968 and Jalal-ud-Din et al., 1968) contain soil and land capability maps showing more detail at a scale of 1 : 125,000. To illustrate the information available in the soil survey reports, descriptions of two soil mapping units are quoted in the Appendix. They are Bhalwal association (from the Lahore report), containing mainly very good irrigated land; and Satghara association (from the Sheikhupura report), containing mainly poor land.

INFLUENCE OF SOIL FACTORS ON BUILDING SITE AND DESIGN

There is a number of factors that influence site planning and design of buildings. These factors include soil conditions, which vary from place to place. Important soil conditions and soil characteristics and their behaviour in relation to use for buildings are described below.

Drainage

Well drained sites are most suitable for all kinds of buildings. Certain areas either have a high water-table or collect run-off from the surroundings, with the result that the soil remains wet for significant periods. Soil drainage has to be considered in architectural planning. Failure to do so means a waste of national resources.

The flooding of parts of Lyallpur city in the past few years can be cited as an example. The soil map shows that an old river channel abuts upon the Lyallpur urban area. Its continuation in fact passes through the city proper. This channel is not very clear on the ground, but the soils developed in the material deposited by this channel, their position and distribution in the landscape indicate its existence and location. The channel collects run-off in its higher reaches within Gujranwala District and, while most of the water moves as subsurface flow, in times of heavy rain there is surface flow in the channel as well. The growth of Lyallpur city on to the central channel area causes obstruction in the flow, which aggravates the flooding problems of adjoining parts of the city. At present, a sort of satellite town is in an advanced stage of layout in the channel area. The natural drainage conditions of the site dictate that either it should not be brought under a township, or adequate drainage should be provided and adapted architectural designs made in the light of this knowledge. The small drain that is being dug at present is probably not sufficient. A more or less similar situation occurs in a part of Peshawar city where natural drainage is impeded, and where a high water-table and flooding pose a major problem for the built-up area.

It is clear from particularly the first example, that reconnaissance soil survey can help in identification of problem areas and in avoiding major problems, but that site inspections will still be needed in addition to determine the best course of action in detailed lay-out of town sections and construction of buildings.

Alkali conditions and salinity

A sizable area in the plains of West Pakistan has soils that are strongly alkali and dense. Generally, these soils are lying barren due to this condition. Since they are unsuitable for economic agricultural development, they are readily available for non-agricultural uses.

Some special measures are needed to use these soils for traffic or industry, after which they are well suited for these uses. Their bearing capacity is high, higher than the surrounding agricultural soils, if rain-water is prevented from standing on the soil. These soils are very hard when dry and are very slowly permeable to water. During rains, only a thin layer of the surface soil gets saturated, but the subsoil remains dry and hard, which makes them very slippery. The slippery conditions on unpaved road shoulders on these soils during and immediately after rains are very dangerous to traffic, and many accidents occur. Examples of these conditions are certain stretches of the G. T. Road, north of Lahore and the last five miles or so of the Lahore-Sheikupura road. This hazard can be overcome by widening the road, metalling and sealing the road shoulders.

As these soils absorb very little rainwater, they require a surface drainage system that can handle run-off during heavy rains.

The alkali soils in West Pakistan are generally saline as well, and many areas of non-alkali saline soils have been mapped besides these. The salts move with the moisture in the soil, and are concentrated wherever moisture evaporates, for example in the lower part of unprotected walls. Therefore, a proper damp-proof course has to be built into any structure to protect buildings and bridges against disintegration by salts. Where the salts include a high concentration of sulphates, as in some of the strongly saline area, normal concrete is subject to damage and sulphate-resistant cement needs to be used in foundations. Sulphate tests will need to be made before construction in areas containing strongly saline soils, particularly in the Indus plains from Multan to the coast. Sulphate concentrations are generally less dangerously high in saline-alkali soils in the northern Indus plains.

Swelling clays

Certain soils shrink and develop wide deep cracks when they dry out. Such soils are generally located in natural depressions and collect run-off from the surrounding area during heavy rains. Upon wetting, they swell again, starting with the partly infilled cracks, and high pressures develop in the subsoil, causing sideways and upward movement of parts that are still dry. Structures such as buildings, paved roads and airport runways are subject to failure if their foundations are sited on such unstable soils without special protective measures. An example, where these conditions have led to road failure occurs on the road from Gujrat to Phalia, especially the eight miles or so near Kotli. Soil surveys are of use for architectural and highway planning, since with their aid the planner can avoid these and similar hazards in most cases, or be prepared for their occurrence and adapt his designs.

Stability and bearing capacity

Soil surveys indicate the character of the subsoil and substratum of soils, and thus can be used to estimate the bearing capacity of sites or areas. Gravelly soils and gravelly substrata are suitable for siting multi-storey buildings whereas raw loess or freshly deposited sediment may be hazardous for such structures. Soils developed from hard rock such as sandstone and limestone generally have a very high bearing capacity.

Also in the Indus plains there are considerable differences in bearing capacity of different soils which are less obvious from the surface. Sandy materials, generally occurring as relatively high areas, and dense saline-alkali soils of any texture can support high foundation pressures, while some silty and clayey soils require low-pressure foundation designs or, in the case of swelling clays, rigid high-strength engineering.

The nature of the soil beneath the paved surface is an important factor in the bearing capacity of the pavement, shrinking and swelling soils requiring stronger and more elastic pavements than more stable soils.

MATERIALS FOR BUILDINGS AND ROADS

Gravel and rock, sand and soil material

Soil surveys facilitate the construction of durable structures at as low a cost as possible. Particularly, their information on the location and extent of sand, gravel and hard rock at or near the surface is of economic importance in site selection, town planning and architectural design. For example,

hauling in sand from a nearby source to a site with low bearing capacity may considerably decrease the foundations cost; the presence nearby of gravel or rock may influence the choice between concrete and brick construction. Where soil material is to be brought in, it can be chosen to the required specifications and brought from the nearest suitable site after reference to soil maps showing the distribution and location of suitable soils.

All soils are not equally suitable for brick-making. For example, around Lahore, certain kilns are famous for the quality of their bricks, whereas other kilns are not so good. Well drained, deep, noncalcareous and brown coloured silty clay loam soils form very good brick materials, whereas saline soils and calcareous soils are of somewhat lower quality. Soil materials containing much kankar are not suitable for brick making. However, the best brick-making material also happens to be prime agricultural land, and the two interests will need to be balanced by proper planning, possibly through zoning legislation.

Low-density aggregate

The use of low-density aggregate to produce light-weight concrete is a recent development in building construction. This aggregate is formed from small balls of certain clays which are bloated (blown up) in furnaces at suitable temperatures. The balls retain their shape but increase in volume, thereby decreasing in density. After cooling they are as hard and almost as strong as normal gravel, but three to four times as light in weight. When these are used in concrete, this material becomes much lighter than normal concrete. This decrease in weight makes it possible to design lighter and cheaper constructions, especially foundations, or to build higher structures with the same foundation costs. Also, the thermal and sound insulation properties of light-weight concerte are better than those of ordinary concrete.

Most clays do not expand upon heating in this way. However, the swelling clay mentioned earlier in this paper is particularly suitable for this purpose. Also, the dense saline-alkali soil material found extensively in the belt of land between the Ravi and Sheikhupura (last unit on the map) has given good results after mixing with one per cent of rice husk or other cheap organic material (W. Kinniburgh, Road Research Institute, pers. comm.). The location and extent of these suitable materials can be found from soil maps and reports. In this way soil survey can guide the siting of kilns for producing light-weight aggregate. A pilot plant has been set up in Lahore.

FUTURE PHYSICAL ENVIRONMENT OF CITIES

The expansion of Lahore is using up very good irrigated agricultural land with alarming speed. For the average citizen, the distance between his house and the peace and quiet of the country is increasing, and he may remain in the confusion and noise of the city environment for months at a time. The first-class agricultural land that is being taken for urban and industrial use is lost forever to the nation and cannot be replaced except at prohibitive cost. At the same time, hundreds of thousands of acres which have no economic potential for irrigated agriculture are lying unused in Sheikhupura district. A large part of this area is close to Lahore, across the Ravi River. Only locally, near railways and main roads, has some of

this land been used for industry, for which it is well suited.

Within the agriculturally useless land that could be used for industry, there are belts of moderate land, also saline-alkali at present, which could be easily reclaimed and would then be well suited for urban use, including gardens. Also, there are some areas of good land which could, and should, be preserved for horticulture, and part for parks. Thus an environment would be created which would be a great improvement over many parts of Lahore at present.

With proper integrated planning for an optimum environment, on the basis of detailed knowledge of the soils, the area around Lahore could be transformed into a garden city across the Ravi to the north, with blocks of industry placed so that they do not spoil the city, and into a green belt with intensive cultivation of vegetables and fruits to the southeast, south and west. Thus, every citizen would have a chance to live as near to a green belt or to open country as at present or nearer, even if the population of Lahore would double. This example of Lahore could be repeated with many of the large and smaller cities of West Pakistan.

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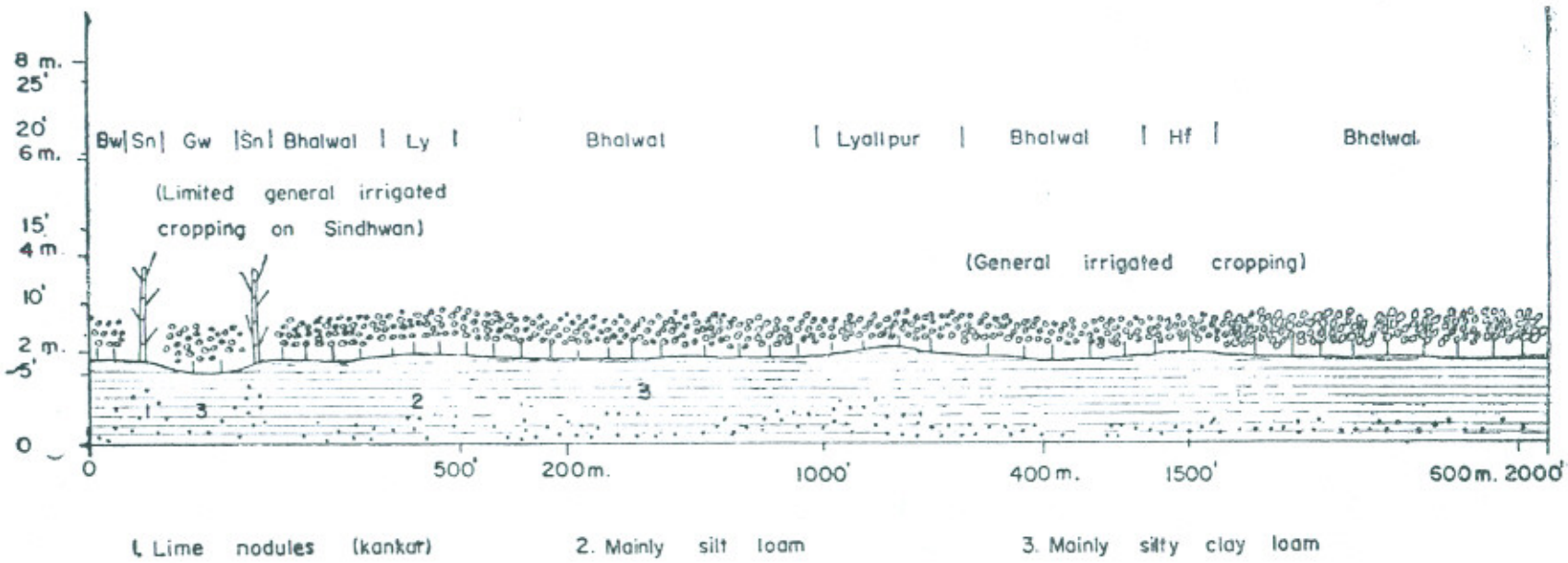
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14. BHALWAL ASSOCIATION

681 square miles, 30.7 percent

Old level terrace

SCHEMATIC CROSS SECTION



DATA

INTERPRETATION

Position and slope	Soil characteristics	Series, phase or land type	Percent	Limitations and hazards	Land cap.	Specific improvements
Extensive level plains	Silty clay loams, moderately or strongly calcareous throughout, lime nodules from 92 to 152 cm (36 to 60 inches)	Bhalwal	75	None, difficult seedbed preparation in about 10 percent of the soil only	irI	Intensive irrigation, improved agronomic practices

Level plains	Silt loams or loams with very fine sand fraction, moderately or strongly calcareous throughout, lime nodules from 92 to 152 cm (36 to 60 inches)	Lyallpur	15	None	irI	Intensive irrigation, improved agronomic practices.
Narrow low strips	Silty clay loams with none-or slightly calcareous subsoil.	Gujranwala	5	None	irI	Intensive irigation
Nearly level transitional areas between extensive level plains and depressions	Silt loams or silty clay loams, lime nodules within 51 cm (20 inches) below surface	Sindhwan and its silty clay loam variant	5	Shallow root zone	irIIs	Cultivation of shallow-rooted crops, more frequent irrigation, application of higher fertilizer doses

GENERAL

Local patches of Hafizabad (loam, irI), moderately deep phases of Bhalwal and Lyallpur (irIIs), Bhalwal and Lyallpur with slightly saline-alkali surface (irIIa) and Bhalwal moderately saline (irIIa) together occupy about 10 percent of the association.

This association is irrigated by perennial canals. Wheat, cotton, sugar-cane, maize, mustard, chillies and locally rice, vegetables and orchards of citrus and mango are the main crops. Yields of all crops are good. The association comprises some of the best soils of the area and is very well suited for intensive irrigation. At present shortage of water limits the potential of this land. Locally irrigation supplies are supplemented by ground-water from tube-wells but usually the ground-water is not fit for irrigation and causes salinity. Great care should be taken in application of ground-water which should be checked for irrigation suitability before installation of tube-wells. Fair quality ground-water is expected at great depths near the south-western edge of this association and could be investigated for tube-well irrigation. A few extra irrigations would suffice to reclaim the land with slightly saline-alkali surface. All soils would greatly benefit from improved agronomic practices including cultivation of improved crop varieties and application of balanced fertilizers. Phosphatic fertilizers should be 'placed'.

See also land use unit 1 and land capability association 1.

15. SATGHARA ASSOCIATION

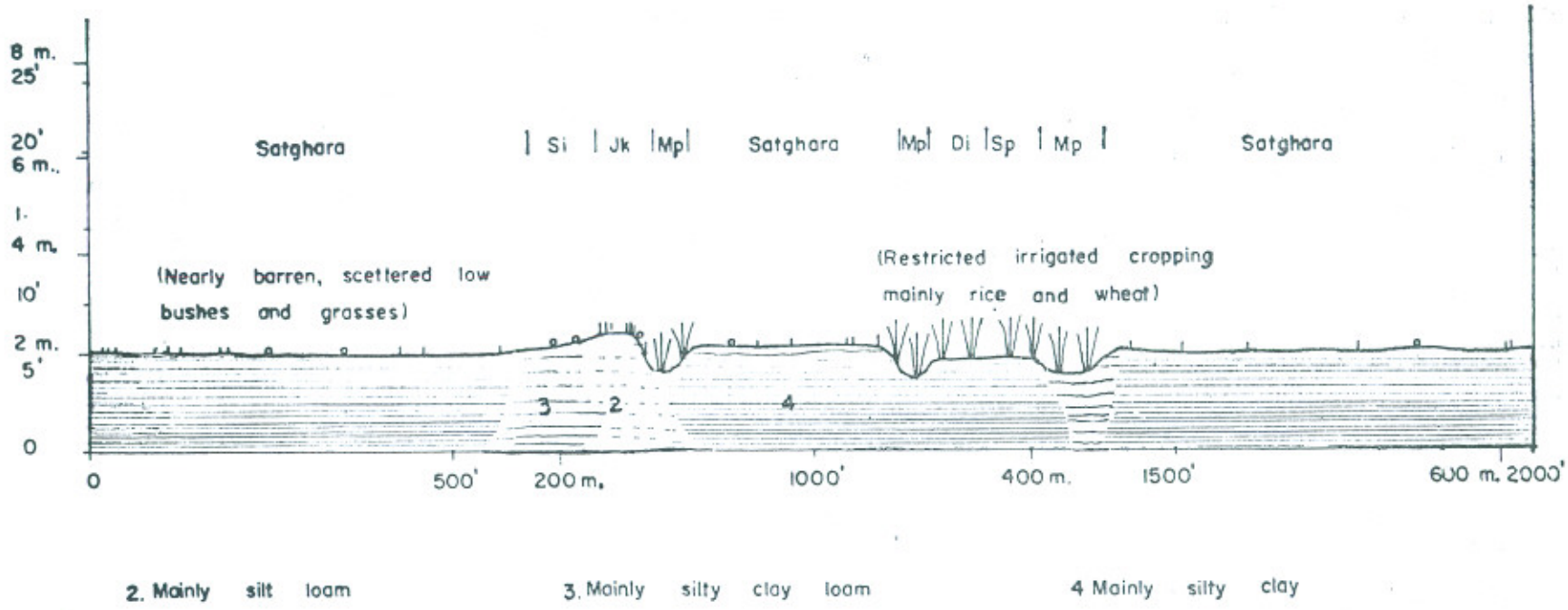
400 square miles, 16.8 percent

Subrecent level floodplains.

Climate : semiarid and subhumid

Rainfall : 254 to 557 mm

SCHEMATIC CROSS SECTION



DATA

INTERPRETATION

Position and slope	Soil characteristics	Series, phase or land type	Percent	Limitations and hazards	Land cap.	Specific improvements
Basin fringes, levee remnants, nearly level plains	Dense, strongly saline-alkali silty clays	Satghara	75	Poor porosity, strong salinity and alkalinity, low permeability.	VIIa or irIVa	Not practical

Lower slopes of levees, nearly level	Dense, strongly saline-alkali silty clay loams	Sindhelian-wali (Si)		Poor porosity, strong salinity and alkali.	VIIa or irIVa	Not practical
Crests of levees, very gently sloping	Porous, saline-alkali silt loams and very fine sandy loams	Jhakkar (Jk)		Irregular relief, salinity and alkali	irIIIa (VIIa)	Land levelling, heavy irrigation, intensive cultivations, light application of gypsum, heavy doses of phosphatic fertilizers
Basin fills, nearly level	Porous, saline-alkali silty clays, mottled in the subsoil and seasonally imperfectly drained	Dungi (Di)	25	Salinity and alkali, clayey texture, collection of run-off water during monsoon season	irIIIa	Provision of local drains, heavy irrigations, rice cultivation, light application of gypsum, mechanical cultivation
Channel fills, nearly level	Noncalcareous, silty clays, mottled in the subsoil, seasonally imperfectly drained	Miranpur (Mp)		Clayey texture, collection of run-off water during monsoon	irIIs	Provision of local drains, green manuring, mechanical cultivation, emphasis on rice and sugarcane
Channel fills, nearly level	Silty clays with weak to moderate structure	Shahpur (Sp)		Clayey texture	irIIs	Mechanical cultivation, green manuring, emphasis on rice and sugar-cane

GENERAL

Most of the association at present is barren and partly with patchy salt bushes and Dab grasses used as poor grazing. Some irrigated restricted cropping of rice, sugar-cane, wheat and berseem is practised on Dungi, Miranpur & Shahpur soils. Yields are poor (on Dungi) to moderate (on Shahpur and Miranpur). Use of balanced fertilizers, and improved crop varieties can considerably increase the yields.

Reclamation of the main members of the association should not be attempted until such times as water requirement of better soils in other areas is satisfied. Development of such land for agriculture is less economic than further intensifying agriculture on better land. This unit should better be used for development of industry, housing or non-agricultural purposes.

Satghara series includes about 15 percent of Satghara shallow and about 5 percent of Satghara noncalcareous variant.

See also Land use association 7 and Land capability association 10.

NEWS AND NOTES

Tarbela Diversion of Indus Completed

The diversion of the Indus river at Tarbela Dam, which began on October 5, have been completed and the entire river water has now been diverted for the first time in history from its original course into a three-mile long diversion channel, says a WAPDA press release.

This diversion marks the end of the first-stage construction of this huge undertaking.

Stating this in an interview here today, the General Manager and Project Director of Tarbela Dam, Mr. Shah Nawaz Khan, described the diversion of the Indus as an historic occasion and an important land-mark of the project.

The Project chief said that the diversion operations were carried out as planned. PPI.

Chashma-Jhelum Canal Completed Ahead of Schedule

The Chashma-Jhelum link canal, which is the biggest of eight link canals constructed under the Indus Basin settlement Plan, has been completed five months ahead of schedule.

The canal, which connects the Indus with the Jhelum, has a discharge capacity of 21,700 cusecs. This canal will feed the Haveli canal and Trimmu-Sidhnai-Mailsi-Bahawal link canal systems which would irrigate Multan and Bahawalpur Divisions.

The construction work has cost Rs. 320 million and involved construction of 34 major structures.

The link was designed by Tipton and Kalmbach, Incorporated, U.S.A., who also acted as Engineers for the construction of the link under WAPDA's administrative control. The construction was carried out by Chaslum contractors, a French consortium, which deployed a huge excavator. This excavator with a digging capacity of 6,500 cubic yards per hour enabled the completion of the canal five months ahead of schedule.

Wapda Team Back from Paris

A six-member Pakistani delegation headed by Mr. I. A. S. Bokhari, Member (Power), WAPDA, returned home after participating at the International conference on large

High tension System (cigre), in Paris, says a WAPDA press release.

The conference this year was attended by over 2,000 delegates from 55 countries and International organisations. Top experts in Power System engineering read papers at the conference and discussed latest advances in the generation and transmission of Power, concerning planning, construction and system operation. The Pakistani delegation included Ch. A. Hamid, retired General Manager (Power), WAPDA, Mr. Akhtar Hasan, General Manager (Generation and Transmission) WAPDA, Mr. Imtiaz Ali Qazilbash, Dierctor Telecommunication, WAPDA, and Mr. Shafique Siddiqui representing the private Sector.—APP.

Electro-magnetic filter for the removal of iron oxides from industrial water

The Kraftwerk Union AG, Mülheim of Federal Republic of Germany, has developed a filter for the electro-magnetic separation of iron oxides. The filter is especially suitable for cleaning feedwater in thermal power stations as well as industrial condensates and water in nuclear plants. The filter removes in the first place ferromagnetic contaminates, though it also partially separates non-magnetic metal oxides. It can be used at temperatures of up to approximately 250°C. and the size of the magnetite particles is of no importance. Between 80 and 99% separation is possible, depending on the concentration of the ferromagnetic particles.

The filter tank, which is made of austenitic steel, is half-filled with balls of steel and surrounded by a copper coil which carries a D.C. current. Thus, a powerful magnetic field with high field-strength gradients is formed within the filter. The water is normally cleaned by passing it up through the filter, the filtration rate being approximately 30 cm/sec.

When the filter is regenerated, the balls of steel are electrically demagnetised and the filter is rinsed for a short time at a velocity which is slightly less than that for filtration. The regeneration processes, which are normally necessary once a week, last approximately 90 seconds.

Seven types of the filter with capacities ranging from 50 to 1000 tons/hour are available. The power consumptions vary from 10 to 50 kw and between 0.5 and 6 tons of wash-water are required.

Extracts from the Replies by the Punjab Gazetted Engineers Association to the Questionnaire of the National Pay Commission, 1970

National Pay Commission issued a Questionnaire and sent it to different Organisations and Associations of all Services. The Punjab Gazetted Engineers Association also sent replies to this Questionnaire. Some of the questions and their replies, which deal with Engineers Condition of Service and emoluments are being published in the 'Engineering News'. These are of vital interest for the Engineering Community and useful for the members working in the Engineering Profession. The replies given clearly indicate the need for Vital Changes in the Services Structure and emoluments of the Technologists.

Q. What should be the guiding principles for determining the Pay Scales for a particular category or class of employees?

The guiding principle in determining the pay scales in Government Service should be that it must attract best talent. The concept of only attracting the "Second-Raters" to Government service is not suited to developing countries where Government is expected to give a lead to people in every sector of activity. The masses in developing countries expect miracles from their Government and are keen to seek quick development to catch up with developed countries and enjoy the same comforts. The type of service expected by the people in developing countries can only be discharged by efficient, honest and clean administration which must be in the hands of 'above average'. Therefore, the old concept of pitching the pay scales of Government employees lower than those in the market should be discarded. On the basis of this principle, a uniform pay grade should be prescribed for various classes of employees in each and every department/ cadre so that there is no inter-service jealousies or distraction of talent from one to the other.

However, there is a need for granting better pay scales to Specialists in various departments. Every department can be split into two categories—generalists and the specialists—The Generalists being those carrying jobs of territorial and routine nature in that profession and can be easily replaced or interchanged without any detrimental consequences. While the specialists would

include Research workers, Planners, Designers, Budget Officers and Medical Specialists. It is not easy to replace them and they have to stay up in their jobs for long time to develop expertise. For instance, in the Engineering Departments, the officers and staff working on Planning, Design and Research should be given higher pay scales than those in the territorial field, mainly because the work of former category is of a very responsible and arduous nature involving high concentration and higher degree of intellect. Similarly, this should apply to Medical Specialists, eminent University Professors and Scholars.

The basis for determining the pay for the lowest category of employees should be the provision of basic necessities of life. The minimum wage must be sufficient to provide subsistence for an average family. This should be the basic unit for unskilled and unqualified worker. For the posts requiring educational qualifications, the pay structure should be so designed that it matches with the number of years spent in attaining the minimum qualification prescribed for the post. The guiding principle in higher posts should be to provide necessities of life commensurate with the status. This Association generally recommends that the seven-tier structure recommended by the P. & S. C. (1962), be adopted uniformly for all Services whether Provincial or Central, with the modifications that a University degree be equated on the basis of minimum number of years spent after matriculation; that is to say, that B.Sc. Engg : and M.B.B.S. be taken as equivalent to an M.A. or M.Sc.

Q. Are these principles generally followed at present in fixing the pay scales of posts under the Government?

The above principles are not being followed at present and there is a large disparity in the pay scales of various services. What we have so far noticed is that the pay scales prescribed by any Pay Commission have been changed to suit more favourably the C. S. P. class who generally frame implementation rules for themselves and for other services. Apart from this, the philosophy of Pay Commissions is generally washed off when special pays are granted to C.S.P. class on each and every appointment. Similarly, when the previous Pay Commissions have been conceding technical pay for graduates in Engineering and Medicine, the C.S.P. Class on the pretext of All Pakistan Service has been pitching its own Pay Scales in such a way that the advantage to the technologists was drowned. Similarly, we have noticed that there is no recognition for the arduous work of Research, Design and Planning or Budget with the result that these appointments remain most unattracted and expertise is not being developed at a place at which it should. Our march to self-sufficiency is already slowed and any further negligence in this respect will be detrimental.

Q. Are there any anomalies, inequalities or imbalances in the existing pay structure? What modifications and improvements would you recommend in the present pay structure in general and pay scales of your service/department organization in particular?

There are numerous anomalies, inequalities and imbalances in the existing pay structure of various services. Firstly, the pay scales of Central Service (especially C. S. P.), are much higher than those in the Provinces although the Central employees

when posted in Provinces are doing exactly the same work and are charged with the same responsibilities as their Provincial colleagues. Secondly, the Government has been granting extra remunerations in the form of Special Pays to officers posted in Secretariat while those specially recruited for the Secretariat are denied those facilities. Thirdly, the officers of C. S. P. when posted in Districts are given district allowances, rent free residences, sumptuary allowances and residential gardens maintained at public expense. Fourthly, officers from C. S. P. posted in the Secretariat at higher level than their counterparts in specialized departments with the result that they not only enjoy higher status but also draw higher special pay. For instance District level officers in Senior Class I grade of all departments are inducted as Section Officers while those from C. S. P. and P. C. S. are inducted as Deputy Secretaries. Fifthly, the whole administration is so designed that whereas special pay is available to all the C. S. P. Officers in almost every appointment, the specialist officers, even when employed on arduous jobs like Research, Design and Planning, are denied those facilities and if allowed, they are pitched lower than Secretariat pay.

Although it has always been recommended by various Pay Commissions that Engineers and Doctors be given additional technical pays in view of longer study courses that they have to go through at the University as compared to ordinary graduates, but this benefit is always neutralized at the implementation stage by pitching their (Engineers' and Doctors') pay scales lower than generalists. The Junior Class I Officers and Senior Class I Officers in the Engineering as well as Medical Departments get the same salary as their counterparts in C.S.P. only after including technical pay. It is hoped that this Commission will ensure that rule makers are not allowed to snatch the small advantage due, to the technologists. It is further suggested that the technical pay should have nothing to do with the rank of an officer and once recognized and given, it should form part of pay throughout his career even above the level of Executive Engineer.

The Engineering discipline in the country is plagued with a caste system within its ranks. At the lowest rung, an Engineer can be recruited as Junior Class I, Class II or Temporary Asstt. Engineer. All these officers have the same functions and same responsibilities to perform at the subdivisional level. But their branding in different classes has been the source of biggest jealousies and should be avoided. All qualified Engineers should be inducted as Jr. Class I officers (Group A of 7-tier structure) as has already been recognized by the Government in the case of P. C. S. and Medical Services. The talented or better qualified people should get the recognition of being placed on top of their batch. The present unhealthy practice of younger officers superseding the older ones in higher promotions merely because of the former's induction through Class I Service, is undermining the morale and officiency of a large number of Engineers.

The cadres of Engineering departments are not allowed to expand in accordance with the expansion of developmental activities and neither are sufficient number of training and leave reserves sanctioned with their cadre. This has resulted in accumulation of a large number of Engineers as 'Temporary' with rather bleak future. We suggest that recruitment as temporary Engineers be stopped and if temporary posts are required, the

officers be inducted on contract basis with higher pay than their permanent counterparts.

The above anomalies are created by those responsible for implementing and framing of rules in the Government Departments. Since these departments are predominently manned by the C. S. P. the first modification suggested is that the FDs and GADs should be democratized to inject other services to formulate and ensure uniform rules and policies. This will serve as a built in check against misuse of powers or exploitation by any one Service. The preferential treatment given by the C. S. P. to themselves while degrading other services is now being openly resented. These are some of the glaring anomalies while detailed examination of various departments will unearth many other inequalities. The present pay structure of various services is based on colonial concept and is seriously impeding our developmental efforts. If the aim is to build Pakistan as a strong country, we must allow free flow of talent towards all faculties so that every individual can select a profession according to his aptitude and there is no repulsion from any profession. This can only be done by equating pay scales of all categories whether serving Provincial Government or the Centre. The concept of Central Service as superior to Provincial should also be done away with.

The concept of granting special pay to the Secretariat officers should be replaced by a uniform allowance to all officers working in head office as staff officers which allowance be called "Staff Pay". As regards "Special Pay", it should only be meant for Specialist officers such as those employed on the work of Planning, Design and Research. The Special Pay in their cases may be pitched higher than "Staff Pay" so that these posts become attractive and are able not only to draw talent but are also able to keep it. The following uniform rate of monthly pay is suggested for all such categories including those in the Secretariat :

Category of Officers	Staff Pay	Special Pay
	Rs.	Rs.
Class II or Jr. Class I Officers (Group B or A).	150	200
Sr. Class I Officers (Xens).	225	275
Jr. Admn. Grade (Pre-PAS).	300	375
Sr. Admn. Grade (PAS).	375	425

We would also suggest uniform pay scales for all services in various tiers. For instance at the Subdivisional level, the SDOs in PWD, SDO Civil, Asstt. S. P., M.O., etc., should all have the same pay scales. Similarly, at the District level, the Xen, DHO, Distt. Inspector of Schools, DFO and Distt. Magistrate and S. P. etc., should have the same scale of pay. The Divisional level officers such as S. Es, DIG, Dy. Dir. Education etc., be grouped together. While the Chief Engineers, Director of Education, Director Health, IG Police etc., be considered as Provincial level Officers with same pay scales and same prescribed length of Service. Technical Pay for Engineers and Doctors should of course continue as separate.

We are in broad agreement with the Seven-Tier structure suggested by the P.&S.C. (1962) and recommend its adoption for all services with the following amendment :

The Engineers and Doctors who possess

Engineering/Medical degrees, should be entitled to direct recruitment in Group 'A' as their education career extends to 4 years or more in the University just like that of an M.A. or M.Sc. The P. & SC. had unfortunately overlooked the fact that Engineering degree is a specialisation in only one of the Engineering disciplines. There was nothing like B.Sc. Engg. being conferred by any of the Universities. It must either be in Civil, Mechanical or Electrical Engineering. The Engineering courses are therefore so designed that except for the first year, the remaining three years are spent in specialising in one of the Engineering Branches. Therefore, just as an M.A. or M.Sc. is taken as specialist in one particular subject, a B.Sc. Engg. degree holder will either be a Civil Engineer, a Mechanical Engineer or an Electrical Engineer and hence a kind of specialist in one of the Engineering disciplines.

Q. What should be the minimum of the time scale of pay for various classes of Government employees?

At present there is a very wide gap between the lowest and highest paid employees of Government. For instance, a Jr. Clerk having starting salary of Rs. 140 p.m. generally retires as Head Clerk at a salary of about Rs. 400 p.m. On the other hand, the Officers group (particularly C. S. P.) getting a start of Rs. 500 retire at Rs. 4000 p.m. Obviously the present scales are strongly biased in favour of officers who get rise of 8 times their starting salary during their career whereas the ministerial staff is limited to a rise of about 3 times in their salary. We suggest that Jr. Clerk should have a starting salary of Rs. 190 and when promoted as Asstt:/Head Clerk, should be able to retire at Rs. 720 p.m. The Officers class be given a starting salary of Rs. 600 p.m. retiring at Rs. 3,500. This will not only narrow down the present gap but will also allow the ministerial staff and the lowpaid employees to have honourable retirement. We also suggest that peons establishment be slowly reduced and instead messengers' system be introduced in Government offices with standardized times for collection of dak from various desks. The offic.rs and officials should learn to walk across to their colleagues and subordinates to discuss cases instead of calling them through peons. The messengers may be recruited from literate persons having education up to Middle class. In this connection we recommend that 7 Tier Structure proposed by the P. & S. C. 1962 be adopted and suggest the following pays for various grades and groups :

Group	Training	Pays suggested for		
		Grade I	Grade II	Grade III
'F'	110	115—1—130	130—2—160	160—3—190
'E'	140	150—2—180	160—3—205	185—3—215
'D'	175	190—4—230	210—4—285	250—7—320—10—375
'C'	225	250—10—350	300—15—525	420—20—720
'B'	350—400	450—25—700	600—30—950	800—40—1000
'A'	500—550	600—50—700	750—50—1000	..
SES	..	1000—75—1600	1500—75—2250 (Pre-PAS)	1600—75—2400
PAS	..	2000—100—2500	2500—100—3000	3000—100—3500

Q. Do you think that the present system of attaching special pay to certain posts or categery of posts should be retained or modified or done away with? What are your concrete suggestions in this regard?

This has been dealt in some detail in some of the previous answers. But we might repeat here that special pay should really be reserved for specialists in various departments and that there is a need for treating Design and Research Cells as purely specialist in whose case Special Pay may be higher than the staff pay and be termed as Special pay.

The present practice for sanctioning special pays for specialist officers is being used to the disadvantage of specialist and a number of instances are available where similar posts in the same department are given different special pays. This is due to wide discretion with officers of the Finance Department who keep on creating precedents which are not allowed to be quoted as precedents. In some departments with limited cadre it may be desirable to have a sliding scale of pay right from Jr. Class I to Jr. Adm. grade so that the specialists do not stagnate due to limited promotion prospects. The scale suggested is :

Rs. 600-50-1000/75-1900/100-2400

which will last for about 27 years of service. The Spl. Pays should be allowed to the officers who have speciallized in relevant subject :

Q. What are your suggestions on the question of facilities that Government may reasonably be expected to provide to his employees in the sphere of housing, transport, health education of children etc.?

The Public Sector being the major employer of educated young men, should realise the responsibility of providing facilities to all its employees just as it expects the Industrialists to look after its employees. The Government should give a lead and set an example for others to follow. What our Governments have not so far realised is the fact that contented Public Servants are a definite asset for efficient administration. The present practice in which high officers get lavish residences besides managing to have official transport needs to be condemned. We suggest that the current race of purchasing big staff cars should be curbed and austere transport be only provided where absolutely essential. The high officers who are entitled to have a staff car at their disposal should not be allowed to travel in their own cars on tours because more often than not, the staff car follows the car of an officer carrying his Secretary which in fact is not only a misuse of official transport but also involves loss to Government in the form of T. A. which is generally claimed by the officers. Similarly, the provision of very spacious houses for top class Government employees should be slashed. No officer (including a Minister) be allowed a house more than 3 bed rooms with a plot measuring over 3 kanals. This will not only reduce the burden on the public exchequer but will also pave a way for austere living amongst Government servants. There is a wave of over-status consciousness amongst Government servants, particularly the Civil Servants, which should be curbed to break the artificial barrier between the people and public servants.

In case of officials drawing salary above Rs. 1500 p.m. the accommodation be provided at 30 times the gross monthly pay. For officials between 1000-1500 the cost of house be limited to 35 times their monthly pay. The officials between 500-1000 be

entitled to houses costing 40 times their monthly pay. The officials between 200-500 be allowed residences costing 45 times their pays while those below 200 p.m. be allowed houses costing 50 times their monthly pay. The Government might provide flat type accommodation with the basic amenities such as water, electricity and sewerage, within the above limits. The houses may be let out on the basis of hire purchase system so that the cost is recovered in 20-25 years. This will not only ease the housing problem but will also dissuade the Government Servants from adopting corrupt practices to build their palaces. No Government servant should be allowed to build his own house during service. On transfer of an official, the house must be sub-let to his successor who might keep on paying the same instalment on behalf of original owner. The maintenance of residences from Government exchequer should be stopped and be either left to owners and tenants or be encouraged to be undertaken on cooperative basis. This scheme could be implemented through public loan or aid from some external agency. The details can be worked out, should this scheme be accepted by the Commission.

Transportation of Government employees from their places of residence to office should be the responsibility of the employer. This will not only encourage punctuality but will also reduce the hardships that most of the employees face today. Indirectly, it may reduce demands on private transport and save our hard earned foreign exchange. The problem of transportation could be substantially overcome if colonies for employees are planned near their offices.

As regard health facilities, the Government is already doing its best in the form of providing free medical aid. But our experience is that even in Government hospitals, the top officers are given preferential treatment and better medicines than the low paid employees. For instance, under the present system, the AMO in charge of low paid employees is not allowed to prescribe life saving drugs as if their life does not have to be saved. This is partly due to overcrowding in Government Hospitals. We suggest that Government should exploit the private sector for providing medical relief to its employees and in this connection it may be better to register doctors and medical practitioners in various localities where the Government Servants of neighbouring localities could get registered for outdoor treatment. The Hospitals may usually concentrate on indoor treatment with very limited outdoor activity. The prescription by the registered doctors may be dispensed through registered chemists who may claim the cost direct from Head of Office concerned after countersignatures by doctors concerned.

Education facilities should be available to Government servants' families as ordinary citizens and no preference need be given to them in this regard. The education up to primary or middle should be free for all citizens and the private institutes helping the Government in this regard should be subsidized where fees must not be allowed to increase beyond a fixed limit. Admission to all institutes should be strictly on merit. In professional institutions and higher education, merit admission should be subjected to a minimum percentage marks say 60% while District quotas be also prescribed on the basis of population so as to ensure uniform development and elevation.

Q. Do you find any discrepancies or defects in the existing system of

compensatory allowance such as house rent allowances, conveyance allowance, local allowance and other compensatory allowances? If so, would you state such anomalies in detail and suggest the manner in which these can be removed.

The maximum limit up to which existing allowances are given to various categories of Government servants is shown in the following table. It will be seen that in the matter of conveyance allowance, the Gazetted and non-gazetted officials are not treated similarly :

	Gazetted	Non-Gazetted
House Rent	nil	330
Conveyance Allowance	500	630
Capital allowance	nil	330

House rent will not be necessary after the Government provides house to all its employees but this may be a very big task requiring concerted efforts spread over a number of years. Till then, however, housing accommodation may be requisitioned instead of granting an allowance which is usually misused by the employees. The powers of requisition may be delegated to Heads of Offices not below the rank of District level. The present rates of conveyance allowance of Rs. 5 for a person living at 3½ miles from the place of duty and Rs. 10 for a person living beyond 4½ miles are on the low side. So long as transport is not provided by Government, the employees' conveyance allowance should be unified on the following basis for all Government servants :

Up to 3 miles	Rs. 10/-
From 3 to 4 miles	Rs. 15/-
From 4 to 5 miles	Rs. 20/-
Above 5 miles	Rs. 30/-

The Government have recognized the dearness of goods in Capital Towns like Lahore, Karachi, Rawalpindi, Dacca. But this allowance is only admissible to non-gazetted staff as if gazetted officers were expected to meet the additional cost by other means. This distinction should be removed and a uniform 'Urban Allowance' should be paid to all the employees on the following basis. We do not agree with the views expressed in some quarters that Government employees in bigger towns are amply compensated by the bigger entertainment available in large town. Infact these attractions also increase their demands and unnecessarily strain their budget :

Pay up to Rs.	200	20/- p.m.
Pay between	200-400	30/- p.m.
	400-600	40/- p.m.
	600-800	50/- p.m.
	800-1000	60/- p.m.
	1000-1500	75/- p.m.
	1500-2000	90/- p.m.
Above Rs. 2000		100/- p.m.

The allowances should be available in all towns with a population of 5,00,000 or above.

Q. Are you in favour of allowing medical officers and other professional employees of Government to engage themselves in private practice? Would you suggest some compensation in the form of non-practicing allowance in lieu of private practice?

We do not favour general permission to doctors and other services to private practice. In the context of present circumstances, the health sector by private enterprise is shrinking besides encouraging malpractices. The private practice should be allowed only to specialists in all professions including Medi-

cines, Engineering, Research, etc. etc. The idea of allowing this facility to specialists is to encourage specialization with latent incentive for hard work through open competition.

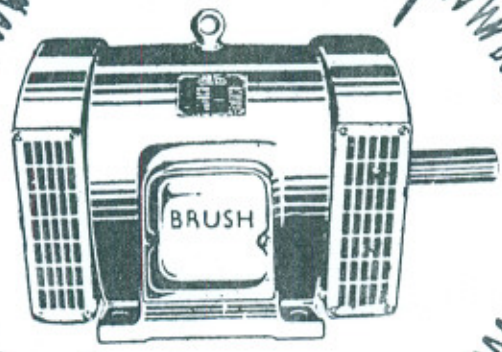
Q. Do you think there should be some recognition/reward for Government employees who improve their professional/technical qualifications? If so, what are your suggestions?

Those Government employees who improve their qualifications in the specific line of their service must be recognized and rewarded. The Association suggests that lumpsum cash reward be provided for any such improvement in professional qualification. The improvement should necessarily be in the field of their employment and not of general nature. Such reward may be admissible to those Government servants who improve qualifications at their own expenses. The officers sent by Government on scholarships need not be rewarded as they receive sufficient compensation by way of scholarship and deputation pay.

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